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Behavioral Economics: When Psychology and Economics Collide

Course Guidebook

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Professor Scott Huettel is the Jerry G. and Patricia Crawford Hubbard Professor in the Department of Psychology and Neuroscience at Duke University, where he has taught since 2002. He graduated with honors from The University of Texas at Austin, with a B.A. in Liberal Arts Honors and Psychology. Professor Huettel received his Ph.D. from Duke University in Experimental Psychology and completed a postdoctoral fellowship in functional brain imaging and decision science at Duke University Medical Center. He has appointments in a number of interdisciplinary units at Duke, including secondary appointments in the departments of Psychiatry and Neurobiology. In addition, he is the founding Director of the Duke Center for Interdisciplinary Decision Science (D-CIDES), which brings together faculty and students from across campus for interdisciplinary research and educational programs. Professor Huettel is a recipient of the Dean's Award for Excellence in Mentoring from the Duke University Graduate School and has been recognized as one of the top five percent of undergraduate instructors at Duke.

Professor Huettel is a leading researcher at the intersection of behavioral economics and neuroscience. His laboratory uses a combination of behavioral, genetic, physiological, and neuroscience techniques to discover the neural mechanisms that underlie higher cognition, with a focus on economic and social decision making. Much of his research—which includes collaborations with neuroscientists, psychologists, behavioral economists, and business and medical faculty—falls within the emerging interdiscipline of neuroeconomics. He is also a Past President of the Society for Neuroeconomics.

Professor Huettel is the author of more than 100 scientific publications, including articles in *Science*, *Nature Neuroscience*, *Nature Reviews*

Neuroscience, *Neuron*, *Psychological Science*, and other top journals in several fields. His research has been featured in many media outlets, including CNN, *Newsweek*, *Money* magazine, and NPR's *Science Friday*. Professor Huettel is the lead author of a primary textbook in neuroscience, *Functional Magnetic Resonance Imaging*, and is a coeditor of the textbook *Principles of Cognitive Neuroscience*. ■

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Behavioral Economics: When Psychology and Economics Collide

Scope:

We all face difficult decisions: which new car to purchase, where to go to college, whether to take that dream vacation now or save more for retirement. Traditional economic models of decision making assume that people make those decisions in what is often called a rational manner—they weigh the costs and benefits of different outcomes, evaluate the future with patience and foresight, and acquire the appropriate information to make a good decision. These models have been extraordinarily powerful for predicting large-scale economic phenomena in a wide range of settings: how consumers respond to price changes, how voters react to new information, and many others.

Traditional economic models work extremely well—except when they don't. In some situations, people make decisions that seem to violate the foundational assumptions of rational choice models. Sometimes monetary incentives decrease people's likelihood to take an action, and sometimes additional choice options lead people to make worse decisions. Over the past half-century, decision scientists have identified anomalies, or biases, in people's behavior that can't readily be explained with traditional economic models. This research has sparked a new field of inquiry now called behavioral economics that integrates economics and psychology—and, recently, neuroscience—toward the goal of better explaining real-world decision making.

This course will provide a systematic introduction to the rapidly changing field of behavioral economics. It will consider how behavioral economics adopts traits from its parent disciplines of economics and psychology but combines them into a new approach for studying decision making. It will explore a remarkable range of counterintuitive and sometimes even paradoxical aspects of human behavior, often revealing that our decisions are based on completely unexpected factors. It won't, however, lose track of the underlying science. Each topic remains in close contact with the

research that experts in the field pursue, and each topic builds to concrete recommendations so that you can understand why we have these biases, what purposes they serve, and how you can turn them to your advantage.

This course begins by exploring the history of behavioral economics, starting with the first recognition that concepts from psychology could actually contribute to the understanding of meaningful economic decisions. It will cover some of the foundational principles of behavioral economics, as encapsulated in the seminal work of pioneers like Daniel Kahneman and Amos Tversky, who created prospect theory. To understand those foundational principles, you will work your way from basic properties of how our brains work, through the psychology of motivation, all the way to our consumer choices in the real world. In addition, you will explore the key motivators for our decisions—factors like probability, risk, reward, and the passage of time—and how we integrate those factors to reach decisions.

The decision process, however, begins well before the moment of choice. So, you will consider what happens before decisions get made by looking at how people acquire information, strategize about the decision process, and simplify complex decisions to something more manageable. You will step back in time to consider the discoveries of Herbert Simon, who developed the idea of bounded rationality, and you will step forward to the latest research on how people use their emotions to shortcut complex decision making. You will explore the nature of randomness, why we see patterns that aren't there, the mistakes we make even when trying to be impartial, and when our experiences aren't necessarily a good guide. In addition, you will explore some underappreciated consequences of our decisions—why we might overvalue things and undervalue experiences and how our sense of self factors into our medical decisions.

You will explore how groups make decisions. Often, a group can reach accurate judgments and make excellent decisions, especially when that group's members are diverse and independent. However, small changes to how groups are formed and how they communicate can make groups much worse than the individuals therein. You will consider prosocial decisions like charitable giving and cooperation, each of which arises in ways that aren't predicted by traditional economic models but are predictable from new

models that incorporate people's sense of fairness, personal identity, and social norms. In addition, you will learn some really remarkable ways in which economic incentives actually undermine good behaviors, particularly when people have social motivations for their actions.

Finally, this course will describe the ways you can use the tools of behavioral economics to make better decisions. The focus will be on two tools that work for a wide range of real-world situations: precommitting to a course of action and changing the frame of a decision problem. These tools—like behavioral economics itself—have attracted interest from government agencies, corporations, and other institutions. Interventions based on behavioral economics hold promise for shaping decision making at a societal level, from how people save for retirement to whether people make healthy eating decisions. However, like much of science, those interventions can lead to resistance or can even backfire, raising important ethical issues.

Through this course, you will gain a better sense of how you make decisions and what steps you can take to make better decisions. You will learn about your limitations and your biases. You will see how you, like everyone else, is an imperfect, short-sighted, and emotional decision maker. However, you will also see how those same biases can help you make very good decisions—when you apply the right tool to the right decision. You will learn how to turn your limitations into strengths. ■

What Is a Good Decision?

Lecture 1

Throughout this course, you will be introduced to tools for improving the process of decision making—the information you acquire and the strategies you adopt. While it's difficult, or maybe impossible, to eliminate your biases, you can use these tools to put yourself in situations where you'll make better decisions—where your biases aren't weaknesses, but strengths. This course explores many aspects of the decision-making process. You will learn how people deal with the different factors that shape their choices: from the value of rewards to the pain of loss, from probability and risk to time itself.

Rational Choice Models

- Traditional approaches to economic decision making invoke the so-called rational choice model, which is a framework for understanding and often formally modeling social and economic behavior. But what does it mean?

- The term "rational" carries a lot of baggage and leads to many misconceptions. A first misconception is that the word "rational" means the same thing in everyday conversation as it does to behavioral economists and other decision scientists. When we describe one of our friends as rational, we often want to imply that they are dispassionate, logical, thoughtful, and in control of their actions.

- However, to a decision scientist, "rational" means "consistency with some model." Rational decisions are not necessarily dispassionate, nor well reasoned, nor selfish. They aren't even necessarily good decisions, from others' perspectives. They simply are consistent.

- Consistency seems like a pretty straightforward criterion. A rational decision maker should always prefer better things to worse things—more money to less. That decision maker should be able to assess

which choices lead to more desirable outcomes; in the language of economics, they should anticipate how much subjective value, or utility, would come from their choices. In addition, they should reliably make choices that maximize their expected utility. We should be able to take the past decisions of a rational decision maker and insert them into a mathematical model to predict their future decisions.

- Conversely, someone whose preferences are inconsistent and capricious would hardly be a "rational" decision maker. Furthermore, consistency shouldn't just apply to consumer purchases; it should apply to all of behavior.

- A second misconception is that a rational decision maker must be completely selfish. Rational choice models do not assume anything about what a decision maker prefers; they only state that those preferences consistently lead to choices. So, it may be rational to give to charity, to volunteer your time to help others, or to make sacrifices for the greater good. All of those actions are consistent with traditional economic models—assuming that someone derives utility not only from their own outcomes, but also from the outcomes experienced by others.

- A third misconception is that rationality refers to the decision process. Rational does not mean that a decision was generated by a conscious or logical or reasoned process. Instead, rationality refers to the outcome of decisions. Rational choice models are sometimes called "as if" models, meaning that choice behavior can be described "as if" someone followed a rational process—regardless of the underlying thoughts, beliefs, or computations.

- There are many different models of rational choice, each developed to explain different phenomena within microeconomics, consumer behavior, or decision science. Despite their diversity, these models tend to be built on a few simple foundations: When making decisions, we should exhibit consistent preferences that follow mathematical rules; we should prefer better things to worse things;

and we should take actions to obtain the things we most prefer, in order to maximize overall utility.

Incentives

- The great virtue of rational choice models is simplicity. Their assumptions are so basic that they almost seem tautological. People want more money, not less. Of course, this must be true—right? This simple statement lies at the core of traditional models. If it were incorrect, as unlikely as that might sound, then rationality itself would fall into question.

- The assumption that people want more money, not less, implies that people should be motivated by the opportunity to obtain more money. That is, money should be an incentive that can shape their behavior. We know that's true in many circumstances, such as the labor market or consumer responses to sale prices.

- Reward occurs when an external incentive disrupts our internal motivation for some behavior, such as paying people to give blood. It's one of the most striking findings in behavioral economics, because it calls into question that most basic assumption of rational choice models: that people want more money, rather than less.

- On the contrary, in many real-world situations, money can actually serve as a disincentive for behavior. This phenomenon is known to economists as reward undermining. It illustrates one of the deepest themes in this course—that traditional rational choice models explain most aspects of decision making but fail in very specific circumstances.

- Money is usually a very powerful incentive. Structuring monetary incentives the right way can have very positive effects. If the government wants to encourage people to save for retirement, it can create tax breaks on retirement savings. If a company wants to encourage its employees to quit smoking, it offers discounts on insurance copayments for nonsmokers.

- These sorts of incentives do work, usually in exactly the ways predicted by rational choice models. When the utility of the incentive becomes sufficiently great, people start behaving in a way that is good for themselves and good for society. Creating and tracking the effects of such incentives represents a major thrust of microeconomics—both in academic research and institutional policy.

Sometimes monetary incentives work as motivation for people, but—surprisingly—sometimes they do not work.

- But monetary incentives don't always work. They fail when they undermine our sense of moral duty; they fail when they crowd out other sources of motivation. Incentives—and rational choice models, more generally—work some of the time and fail some of the time.

- The failures of rational choice models aren't random. They aren't just anomalies that can be dismissed, rare events that can be explained away. Rational choice models fail to account for real-world behavior for specific reasons—reasons rooted in our psychology, biology, and environment. Rational choice models fail, and we can know why.

Deal or No Deal

- Economists who analyzed the decisions of *Deal or No Deal* contestants found something surprising. As the game progressed, contestants tended to become more and more risk seeking, almost regardless of what happened. Contestants who were unlucky kept chasing after what little money was left. Contestants who were lucky stayed in the game in search of the largest prizes.

- All of the sounds, lights, and excitement of the game show push the contestants to become more risk seeking than they probably would be in everyday life.

- *Deal or No Deal* contestants make decisions about real money. They are motivated by large amounts of money; one contestant won a prize worth more than four million dollars. We might expect that they would make good, cautious decisions, but they often don't.

Constraints

- Do people make good, cautious decisions when the stakes get large—including buying cars, selecting a mortgage, and saving for retirement? Do they attend to the details, knowing how much more is on the line? The same biases found in the small decisions in the grocery store or laboratory also appear in the biggest decisions of our lives.

- We don't have special machinery that we can suddenly turn on when we face a big decision. We're stuck with the same brain circuits that helped our ancestors forage for food and track down prey—but never evolved to compare fixed- and adjustable-rate mortgages. We use what we have, even if we occasionally end up losing.

- Throughout this course, two fundamental types of limitations on our decision making will be emphasized. The first involves constraints on our cognitive abilities. Much as we might hate to admit it, there are limits on our intellectual capacities. We can't know everything, remember everything, and compute everything. Some people work well with numbers and data and can do complex calculations in their head. Other people have more difficulty with numbers and adopt different strategies for making decisions. But none of us is a supercomputer. There are some types of thinking that we do extremely well and other types that we do very poorly.

- We don't process information in absolute terms, for example, but in relative terms—by comparison to a point of reference. Even though a silver medal is objectively better than a bronze medal, after they

win, Olympic bronze medalists tend to be happier than silver medalists. That's because they adopt different reference points: The bronze medalists think that they did well enough to earn a medal, while the silver medalists think that they didn't do well enough to earn a gold medal.

- Our brains are set up to use reference points; it's a way of simplifying the decision process. Using reference points does help in many circumstances, but if we adopt the wrong reference point, we lose perspective on what really matters.

- The second type of limitation is that we do not have unlimited time to make decisions. Real-world decision makers don't always have the luxury of waiting until all of the information is collected.

- Time constraints affect our economic decisions. When deciding whether to purchase a home, time is both your friend and enemy. Acting slowly gives you more time to gain information and deliberate on this largest of all purchases. But acting slowly also carries opportunity costs: Someone else may put in an offer, or interest rates may increase.

- These two limitations—cognitive abilities and time constraints—prevent humans from being the ideal rational decision makers posited by traditional economics. We cannot make optimal decisions that always lead to the best outcome, even if we wanted to.

- But we can recognize these limitations and try to optimize the decision process. The economist/psychologist Herbert Simon introduced the idea of bounded rationality, or rationality within limits. Simon contended that the key challenges for real-world decision making were in acquiring the right information, in simplifying the decision process, and in adopting strategies for decision making.

- We can't overcome these challenges by becoming even more analytic and deliberative in our decisions. Instead, we adopt rules

called heuristics that allow us to prioritize some information over other, that simplify complex decisions into something manageable, and that give us strategies that can be implemented quickly and with little effort. Those heuristics help us improve our odds of making a good decision, even in the face of our limitations. But, like us, they're not optimal; they're just good enough, most of the time.

Suggested Reading

Kahneman, *Thinking, Fast and Slow*.

Questions to Consider

1. What sorts of decisions seem most difficult, and what features of those decisions make them seem so challenging?

2. What limitations of our biology—including limitations on how we think—might change how we approach complex decisions?

The Rise of *Behavioral* Economics

Lecture 2

We don't need science to tell us that we aren't rational decision makers, at least in the way assumed by traditional economic models. We only need a moment of introspection, and we'll recognize our own limitations. But we do need science to help us understand those limitations and identify ways of overcoming our limitations—and becoming better decision makers. In this lecture, you will start to understand how decision scientists capture the biases in our decision making by exploring the fundamentals of behavioral economics.

Traditional Models

- In Milan, Italy, in the middle of the 16th century lived a physician named Girolamo Cardano. He is most famous today not for his medical virtues—which were considerable—but for one of his vices. He was a pathological gambler. Like the typical pathological gambler, he lost more than he won, but his losses inspired him to invent the mathematics of probability.

- Cardano's masterwork, *A Book on Games of Chance*, introduces probability as a way of thinking about gambling. If a gambler throws a six-sided die, the probability of rolling a five is one in six. Probability is thus defined as the number of desired outcomes divided by the number of possible outcomes. This definition can be applied to sets of outcomes as well: There are four distinct ways of getting a total of five when rolling two dice, out of 36 possible combinations. That means that the probability of rolling five on two dice is four in 36, or one in nine.

- By multiplying the amount that could be won by the probability of winning, the gambler could calculate what came to be called the expected value of a risky choice. Expected value is one of the landmark concepts in all of decision science—as well as in statistics

and economics, more broadly. It provides a simple rule for decision making: Choose whatever option maximizes expected value.

- However, expected value has its limitations. For example, take the simplest sort of gamble: betting on the outcome of a single flip of a coin. Suppose that your friend pulls out a coin and offers you a bet: If it lands heads, then you'll win 10 dollars, but if it lands tails, then you'll pay your friend five dollars. The expected value is clearly in the bettor's favor: A 10-dollar gain is twice as much as a five-dollar loss. And, indeed, most people are willing to take this bet.

Coin tosses are the simplest sort of gamble.

- But what happens if the stakes are increased? If the coin lands heads, then your friend will pay you 10,000 dollars; if the coin lands tails, then you will pay your friend 5,000 dollars. Do you take that bet? Expected value argues that you should take that bet; it's still very much in your favor. But many people would decline this bet.

- The mathematician and physicist Daniel Bernoulli, writing in the middle of the 18th century, used problems like this to argue that expected value did not account for people's real decisions—for two reasons. First, people placed different values on a good, like money, depending on their desires and circumstances. Second, a given amount of money was more important to people who had very little than to people who had very much. So the chance of a large gain might not be attractive, if we risk a large loss.

- Bernoulli argued that expected value needed to be replaced by a new concept, which we now call expected utility. Economics defines "utility" as the subjective value that is placed on some good or action.

- Over the next few centuries, economists developed models that assumed that people act to maximize their expected utility. Two people might make different choices because they prefer different goods, or one might be risk averse while the other is willing to tolerate risk, but each choice is assumed to maximize one's own utility. These are the so-called rational choice models. They assume that, in order to maximize utility, people have consistent preferences and make decisions that express those preferences.

- By the mid-20th century, rational choice models dominated economics—not only because those models could be built up from basic axioms and mathematical operations, but also because rational choice models were undeniably effective. Economists and other social scientists used them to explain market behavior; how companies developed incentives for their workers; how consumers responded to changes in prices; and even questions seemingly outside economics, such as how people vote or why countries go to war.

- But, in some ways, the very power of rational choice models had a blinding effect on the social sciences. When people's real-world decisions deviated from what was predicted by those models, then the behavior was questioned, not the models. Deviations from the models were often seen as unimportant anomalies—oddities of human behavior that were explained away or simply dismissed. But there have been clear examples that question the core assumptions of rational choice models.

New Themes in Economics

- In the early 1960s, an economist named Vernon Smith was questioning some of the core assumptions of rational choice models, particularly as it applied to buying and selling within markets. To

Smith, some of those assumptions didn't make sense. For example, a common assumption was that people have complete information about the qualities of goods to be traded, the rules of exchange, and everything else. Complete information was thought to be necessary so that markets reach equilibrium—the steady state in which buyers and sellers are matched and exchange freely, with no shortages and no surpluses.

- But people don't have complete information; they don't know everything about the decision situation. And even if they did know everything, there's no guarantee that they would use that information efficiently.

- So, Smith created markets in a laboratory. He could control what information people had and the rules of their interactions, and then he could observe what happened. He found something remarkable: Even though people didn't have full information, and weren't necessarily rational in their behavior, his markets reached equilibrium anyway. Therefore, one didn't need rational individuals to explain rational market behavior.

- This sort of research—simulation of markets within a laboratory—can be called experimental economics. The key object of study for experimental economics is market performance, how markets behave given what individuals know and value. And, in that domain, experimental economics has been very successful.

- But there was a second new direction for research that began in the 1960s. Around the same time as Smith's early experiments, some economists and psychologists began to study individuals' choices in other contexts besides competitive markets, to better understand the biases and anomalies in decision making. This new enterprise became known as behavioral economics.

Behavioral Economics

- Behavioral economics applies experimental methods from psychology and other social sciences to problems in economics.

Importantly, it begins with observations about real-world behavior and then constructs models that can explain that behavior. That's the opposite approach from traditional economics, which began with rational choice models and then applied those models to real-world behavior.

- Behavioral economics combines methods from economics and psychology. These are both very large fields of science, so not all psychologists nor will all economists think the same way. But in general, research psychologists think about processes. They are interested in the processes of perception, attention, memory, and decision making that shape how we think and what we do. In contrast, research economists think about outcomes—how does a change in one variable influence another? Psychological concepts might be useful in explaining those outcomes, but that's not what's critical.

- A behavioral economist would likely be interested in both processes *and* outcomes: Why people choose something is as important as what they choose. So, the behavioral economist needs to set up experiments that reliably evoke specific psychological processes as well as specific decisions.

Experimental Methods

- Behavioral economics experiments are planned with three principles in mind. First, experiments must be incentive compatible. That is, the participants should have some incentive to reveal their true preferences. This is usually accomplished by paying people for their choices.

- The easiest way to maximize incentive compatibility is to pay people for all of their choices. But if an experiment involves dozens or hundreds of decisions, paying people for every choice gets expensive quickly. So, a common procedure is to select one or a few choices—randomly from all of the choices made—and then pay someone for only those few choices. This ensures that

the participant treats every choice as if it were being paid, while keeping the total payment to something manageable.

- The second principle of behavioral economics experiments is no deception. When participants come to the laboratory for an experiment, they know that they're in an experiment, so there's always the concern that they'll behave differently in the experimental setting than they would in the outside world. So, we tell people the truth: We tell them the sorts of decisions that they will make, what they might be paid, and how they will be paid.

- The third and final principle of behavioral economics experiments is no external influences. An external influence is anything other than the decision itself. To determine how people will actually behave in the real world based on how they behave during the experiment, external influences need to be eliminated.

Prospect Theory

- Behavioral economics integrates experimental methods from psychology and economics and applies those methods to better understand how we make decisions. That simple description covers a very wide range of research, and across many disparate sorts of decisions, there are some common features that can help us think about many different decisions.

- By the late 1970s, experiments in the nascent field of behavioral economics had revealed many different anomalies in decision making—ways in which people's decisions didn't quite match what was predicted by rational choice models. These anomalies were compelling, often striking, but they were easy to dismiss. There wasn't any sort of underlying theory that could explain why people were biased, why they made good decisions in one context but bad decisions in another.

- However, in 1979, a paper was published in one of the most prestigious economics journals by psychologists Daniel Kahneman and Amos Tversky that had experimental data that showed biases

in how people made decisions between monetary gambles—what Kahneman and Tversky called prospects because they were potential future gains and losses. These were the same sorts of simple choices that engaged Cardano and Bernoulli centuries before.

- Kahneman and Tversky's theory, called prospect theory, uses two concepts—probability weighting and reference dependence—to explain what people value. Probability weighting means that people treat some changes in probability as more important than others. Reference dependence means, simply, that people make decisions based on the perceived changes from some reference point.

Suggested Reading

Camerer, "Prospect Theory in the Wild."

Kahneman and Tversky, "Prospect Theory."

Questions to Consider

1. Why might behavioral economics be viewed with suspicion by at least some mainstream economists?

2. Why do behavioral economics experiments need to use real incentives, and why might people's decisions change depending on whether incentives are real or hypothetical?

Reference Dependence—It's All Relative

Lecture 3

To understand many real-world decisions, we first need to understand why people value some things more than others. One possibility is that value comes from experienced or anticipated pleasure. But that isn't consistent with how our brain's reward system is set up—the key dopamine neurons aren't necessary for pleasure. Instead, these dopamine neurons respond in a way that encourages us to seek out new and better rewards. Our brain responds to new information about rewards, not necessarily to rewards themselves.

Economic Value

- Why do we choose something? Think about just how complicated even a simple decision, such as selecting a bag of tortilla chips, can be. Your normal snack preferences, your knowledge of different brands, your sense of nutritional value, and even the aesthetic quality of the packaging, among many other factors, all come together into some internal sense of value.

- That seemingly simple term, "value," lies at the heart of decision making. If we can understand how value is calculated, then we can understand the choices people make. In addition, we can learn more about how people's choices go awry—in day-to-day consumer choices, in long-term financial investments, and even in well-known medical disorders.

- Consider the term "value" from an abstract, economic point of view. One natural speculation is that positive value corresponds to pleasure—we purchase tortilla chips because they generate pleasure—whereas negative value corresponds to pain.

- In addition to pleasure, value is determined by how much we benefit from something. Many of the things that we value have clear benefits. Food provides nutrients, clothing protects us from

the elements, our homes provide shelter, and even our social interactions have value through the well-being of our children, relatives, and friends. Some scientists extend this argument all the way to what is called adaptive fitness; they argue that value can be defined by the extent to which an action improves our chance of passing along our genes.

- Clearly, our decisions are influenced in some way by all of these sorts of tangible benefits. But it is easy to come up with counterexamples. Think of a recent trip to a restaurant. You might have paid a premium to eat a well-marbled steak, a plate of aged cheeses, or a tempting chocolate dessert. Going to that restaurant surely generated pleasure, but if anything, it provided fewer nutrients and had more deleterious effects on your health than much less expensive options—for example, cooking a fresh, simple meal at home.

- We can't explain what we value by either pleasure or benefits alone; they often trade off against each other. There are even cases where the value of a good can be completely detached from its benefits. An example is a rare designer handbag, which is valuable precisely because it is rare and exclusive, and thus, its demand actually increases with increasing price.

- In many situations, people spend too much money on things that have direct, tangible benefits, like material goods, and too little money on things that only lead to transient experiences, like vacations and social interactions.

Neuroscience: Dopamine

- Neurons are the information-processing cells within the brain. There are about 100 billion neurons in your brain. Each neuron receives signals from other neurons, integrates those signals, and then forwards a new signal to another part of the brain.

- There are bumps and folds along the outer surfaces of the brain. The main bumpy, folded structure is the cerebrum (or cerebral cortex),

which sits on top of a long stalk, whose bottom is the spinal cord and whose top is the brainstem.

- Different parts of the brainstem contribute to different aspects of bodily function. Some help regulate automatic processes like breathing, while others shape whether we are awake or drowsy, and still others play a role in emotions and feelings.

- The ventral tegmental area (VTA) is a tiny structure within the brainstem. There aren't many neurons in the VTA. Of the 100 billion neurons in the brain, only about half a million of those neurons are in the VTA. But those neurons are critical for our ability to make decisions.

- Within each neuron, signals travel electrically—that is, electrical currents travel along the membrane walls of the neuron. When one neuron sends signals to other neurons, those signals travel from the cell body at the center of the neuron down a long structure called an axon. If a thin electrical wire is inserted into the brain next to one of these neurons, then that wire can record those electrical signals and bring them to a computer.

- Sometimes the neuron only sends a few signals in a second; other times the neuron is much more active, and signals come out in rapid bursts. We call this the firing rate of the neuron.

- A dopamine neuron is a neuron that uses the chemical dopamine to communicate with other neurons. Each time an electrical signal moves along the neuron, it ends at a gap between neurons called a synapse and then triggers the release of the chemical dopamine. That dopamine is taken up by adjacent neurons, where it can in turn increase their activity.

- It had long been recognized that dopamine neurons—in the VTA and in other nearby structures—are critical for movement and actions. Degeneration of brainstem dopamine neurons has long been known to be a hallmark of Parkinson's disease, which can lead

to an inability to control voluntary motor movements, rigidity, or uncontrollable tremors. More recently, however, neuroscientists began to recognize that dopamine neurons played an important role in how the brain determines value.

Reward Prediction Error

- In the early 1990s, the neuroscientist Wolfram Schultz was exploring the function of VTA dopamine neurons in experiments with monkeys. By lowering a very thin wire into the VTA of a monkey, he could record the signals from one VTA neuron at a time while the monkey received rewards that it valued, such as juice.

- Schultz discovered that the same dopamine neuron increased its firing rate when the monkey received juice or received a warning signal about future juice but decreased its firing rate when the monkey didn't get the juice it was anticipating.

- These results point out the first fundamental property of dopamine neurons: They do not respond to rewards themselves but to the difference between expectation and reality. This concept is now known as reward prediction error.

- Unexpected positive events, like unexpected praise, increase the activity of our brain's dopamine system. Events that are worse than our expectations, like when we are expecting praise but don't receive any, decrease the activity of our brain's dopamine system.

Wanting versus Liking

- Research on the association between dopamine and reward has led to a general conception that dopamine is the "pleasure chemical" in the brain. But does the activity of dopamine neurons really correspond to pleasure?

- Facial expressions associated with pleasure and with aversion are similar in rats, monkeys, humans, and many other mammals. Psychologist Kent Berridge and colleagues realized that they could rely on facial expressions to assess whether a rat found some juice

pleasant or unpleasant. So, they ran the critical test to evaluate where dopamine neurons were associated with pleasure.

- They used a very selective neurotoxin that lesioned, or selectively damaged, neurons in part of the dopamine system in their rats. Without those neurons in good working function, the rats became aphagic, meaning that they wouldn't eat. More specifically, they wouldn't exert any effort to obtain food or even juice, even if they were hungry or thirsty. Without an intact dopamine system, these rats no longer *wanted* rewards like food or juice.

- However, they would still eat or drink if the food or juice was placed into their mouth. When these rats with damaged dopamine systems received something pleasurable, like sugar water, they leaned forward, made a round mouth, and licked their face and paws—exactly like neurologically normal rats. In other words, they liked sugar water.

- When the aphagic rats received a bitter solution, like lithium water, they gaped their mouth, protruded their tongue, and shook their head—again, exactly like neurologically normal rats. They disliked the bitter solution.

- So, if part of a rat's dopamine system is disabled, it will not walk across its cage to consume food, but it still shows normal hedonic responses to pleasant and unpleasant stimuli. These results are compelling evidence that dopamine neurons are not associated with experiences of pleasure, or *liking*, but for motivating animals to seek out rewards—what researchers call *wanting*.

- What causes liking, if not dopamine? Current research suggests that feelings of liking are associated with the activity of a different sort of neuron—one that uses opioids as neurotransmitters—but there's much more to be learned.

Parkinson's and Pathological Gambling

- Parkinson's disease is associated with the death of dopamine neurons. As the disease progresses—and more and more of those dopamine neurons die—it impairs movement, disrupts balance, and causes motor tremors. Parkinson's disease can't be cured, but its symptoms can be alleviated by drugs that replenish the brain's supply of dopamine and intensify the effects of dopamine in the brain.

- Based on the properties of dopamine neurons, side effects of those drugs might include amplifying the influence of unexpected changes in reward and increasing wanting, or reward-seeking behavior. If you have these two side effects, probably the worst place for you to go would be a casino.

- By the late 1990s, some neurologists were noticing that a few Parkinson's patients were also exhibiting uncontrollable pathological gambling; they would regularly go to casinos and

Pathological gambling has been discovered as a behavior that some Parkinson's patients have experienced as a result of the drugs taken to help alleviate symptoms of the disease.

spend much more than they should. But there wasn't any sort of general appreciation of this link. Many clinicians still thought of Parkinson's as a movement disorder and didn't appreciate the connections between dopamine and reward.

- However, in 2003, researchers at the Muhammad Ali Parkinson Research Center in Arizona conducted a comprehensive study and discovered that those patients who had been treated with the particular drugs that intensify the effects of dopamine had a greatly elevated rate of pathological gambling.

- Since this research, neurologists now recognize that some medications for Parkinson's disease can increase the risk of problem gambling, so they warn their patients of those risks and watch for signs of gambling or other compulsive behaviors.

Suggested Reading

Rangel, Camerer, and Montague, "A Framework for Studying the Neurobiology of Value-Based Decision Making."

Zweig, *Your Money and Your Brain*.

Questions to Consider

1. What is the difference between pleasure and motivation?

2. Under what circumstances could raising the price of a good increase its desirability?

Reference Dependence—Economic Implications

Lecture 4

One of the cornerstones of behavioral economics is prospect theory, a descriptive model that attempts to explain what people will choose, not what they should choose. Prospect theory has two big ideas: reference dependence and probability weighting. In this lecture, you will explore the idea of reference dependence—what it means, why it is important, and what mechanisms create it, along with how it influences real-world decisions. Reference dependence can bias even our biggest decisions, shaping what we think about home purchases or retirement investing. However, reference dependence can also be one of the most powerful tools for making good decisions.

Reward Prediction Error

- Dopamine neurons in your brainstem respond to a range of rewards. Specifically, they change their rate of firing in a predictable manner: They increase their firing rate when rewards are better than expected but decrease their firing rate when rewards are worse than expected. In addition, if a reward is completely predictable—as when there was advance warning that the reward would be delivered—then the firing rate does not change at all.

- This is called the reward prediction error. The brain creates an expectation, or reference point, about what reward should be received at each point in time. When rewards are better than expected—or when the animal gains information about unexpected future rewards—then dopamine neurons increase their firing rate. If rewards are worse than expected, then dopamine neurons decrease their firing rate. Importantly, if some reward is exactly as expected, then firing rates do not change at all.

- Dopamine neurons do not respond to rewards themselves; they respond to whether a reward was better or worse than the current reference point—the reward prediction error.

The Endowment Effect

- Reference dependence is one of the big ideas in behavioral economics. It leads to some of the most striking biases in our choice behavior—biases that we can learn to minimize in order to make better choices. One of the most famous biases is called the endowment effect. This bias has deep consequences for decision making.

- The endowment effect originally attracted the attention of economists because it helps to explain some puzzling features of market behavior, such as the fact that people don't trade goods as often as predicted by economic models.

- Suppose that when people ordered this course, half of them (randomly chosen) were sent a complimentary gift. You were one of the lucky ones. You received a mug with a *Behavioral Economics* logo on the side.

- A week goes by, and you unexpectedly have the opportunity to sell the mug. How much would someone have to pay for you to sell them that mug? Behavioral economists refer to this amount as your willingness-to-accept price. A typical amount in a laboratory experiment might be around 10 dollars; people are willing to accept 10 dollars in exchange for the mug they own.

- Now, suppose that you weren't one of the lucky ones. You didn't receive a free mug in the mail, and you don't know anything about that promotion. Instead, you just received an email offer to purchase the same *Behavioral Economics* mug. How much would you be willing to pay for that mug? In a typical laboratory experiment, people would be willing to pay about five dollars to purchase a mug.

- So, this hypothetical experiment would create two groups of people. The ones who received mugs would only be willing to sell them if they received 10 dollars or more. But the ones who didn't receive mugs would only be willing to buy them for five dollars or less. In other words, owning the mug shifts your reference point, so that

your willingness-to-accept price becomes much greater than your willingness-to-pay price.

- A discrepancy between willingness to accept and willingness to pay leads to inefficient market behavior. Consider a good that is in limited supply, such as tickets to a basketball game. The market price for those tickets should depend on matching buyers with sellers. Over time, the tickets should end up in the hands of the people who find them most valuable.

- Suppose that there were 500 tickets available for a game and that 1,000 people wanted those tickets. If the tickets were first given out to 500 randomly chosen people, then market theory predicts that some of the people who didn't get the tickets would try to buy them from those who did and that the tickets would eventually end up in the hands of the 500 people who placed the greatest value on those tickets. But this doesn't happen.

- Duke University actually allocates basketball tickets to its students in this fashion: Students sign up for the option to buy tickets, which are then allocated by lottery. Students who entered one lottery for championship game tickets were interviewed beforehand. The median amount that students would be willing to pay to buy a ticket was 150 dollars, but the median price that people would be willing to accept to sell a ticket was 1,500 dollars.

- The random endowment changed the very way that these students thought about the basketball tickets. The students who won the ticket lottery described going to basketball games as an almost priceless experience. But the students who lost the lottery thought of the tickets as a consumer good.

- This ticket lottery provides a prototypical example of the endowment effect. Randomly giving some people a good—for example, basketball tickets—increased its subjective value by a factor of 10. Needless to say, these basketball tickets are not

commonly traded on an open market. Sellers want far more money than the buyers are willing to pay.

- To an economist, the allocation of Duke basketball tickets is inefficient. The random distribution process leads to an enormous endowment effect, preventing the flow of tickets to those who valued them most beforehand. But the process does have its advantages. The lucky winners see their tickets as extraordinarily valuable, which increases attendance, the enthusiasm of the crowd, and the team's home-court advantage.

Loss Aversion

- Reference dependence also contributes to a general bias toward loss aversion. People are more sensitive to economic losses than to economic gains. How much more sensitive? When we bring people into the laboratory for experiments, we ask them to make simple decisions about real gains and losses.

- We might ask them whether they would be willing to play a coin-flip game where if they flipped heads we pay them 20 dollars, but if they flip tails they pay us 15 dollars. Some people are willing to play that game, but most people aren't. When we improve the stakes to a gain of 20 dollars versus a loss of only five dollars, then almost everyone is willing to play the game.

- Across many experiments over many years, researchers have calculated the ratio of gains to losses at which people become willing to play this sort of coin-flip game. That ratio, which is called lambda, is typically a little less than two to one—that is, economic losses influence this simple decision approximately twice as much as economic gains. This is not a small bias, and almost everyone has it to some degree.

- Salespeople, marketers, and even political campaigns recognize the power of loss aversion for shaping your behavior. It results from a fundamental feature of how your brain works: reference dependence. By evaluating outcomes in terms of changes from

a reference point, your brain can use the same simple sort of computations in its decision making as it does in vision, hearing, and many other processes. Reference dependence provides a simple and flexible tool for functioning in a complex world. You can't just make reference dependence go away, even if you wanted to.

Minimizing the Effects of Reference Dependence

- One of the most powerful ways we can minimize the unwanted effects of reference dependence on our behavior, using it when it's helpful but not letting it guide us astray, is the simplest: shifting your point of reference. Suppose that you are considering whether to raise the deductible on your auto insurance. When thinking about insurance the usual way—in terms of protecting an asset like your car—you might be relatively conservative and want lower deductibles.

- But you can shift your point of reference and think of insurance differently: It is forfeiting a sure amount of money against an

Consider separately the larger and smaller consequences of a decision. For example, would you separately buy custom floor mats if you weren't already buying a car?

unlikely event. When people think about insurance as a necessary cost, people tend to be relatively risk tolerant and want higher deductibles. Shifting the reference point you use for a decision is one way to reframe the decision problem.

- A second useful approach is to consider separately the larger and smaller consequences of a decision. When making a very big decision, it is easy to lose perspective; against the total cost of a new car, spending extra on custom floor mats, for example, may not seem like a big deal. Ask yourself: If I already owned this car, would I pay 500 dollars for better floor mats? When you change your perspective, saving that 500 dollars may seem like a much better idea.

- Third, and finally, create hypothetical alternatives for your decision. Should you splurge on an extended family vacation this year? Of course, the vacation will be fun, and of course, the vacation will be expensive. By itself, it may be difficult to know whether the benefits are worth the costs. So, force an alternative point of reference: On what else would you spend the money? An alternative sort of vacation? A new car? Additional retirement savings? Very few economic decisions are made in complete isolation, and you can improve your chances of making good decisions by forcing yourself to create alternatives.

Suggested Reading

Carmon and Ariely, "Focusing on the Forgone."

Lakshminaryanan, Chen, and Santos, "Endowment Effect in Capuchin Monkeys."

Questions to Consider

1. In what ways might using reference points simplify our decisions?

2. What are real-world examples in which the endowment effect causes things we own to be overvalued?

Range Effects—Changing the Scale

Lecture 5

There are no big decisions. Regardless of whether you are buying a house or a cup of coffee, the processes that underlie your decision are similar. The same brain systems help you anticipate potential rewards, evaluate potential risks, and compare one option with another. You don't have any sort of special module in your brain that turns on for decisions that really matter—for those big decisions. In this lecture, you will learn about the adjustment process, which leads to something called range effects, that allows the same system to handle decisions both big and small.

Range Effects

- The range of some quantity is given by the span of its potential values. For example, fast-food prices vary over a small range (a few dollars); prices of jackets vary over a larger range (tens to hundreds of dollars); and televisions vary over an even larger range (hundreds to thousands of dollars).

- The basic principle of a range effect is as follows: Our sense of a meaningful difference in some quantity is inversely proportional to its range. If the typical price for an espresso and biscotti in your area is five dollars, when you see that a new coffee shop charges ten dollars for the same thing, you might walk out because the coffee is too expensive.

- If a typical price is five dollars, then each extra dollar represents 20 percent of that range—a huge effect. What matters is not the absolute change in price, but the relative change in price compared to the range.

- This phenomenon allows us to explain both sides of our paradox. The same five-dollar savings represents a large proportion of the range when we're purchasing coffee, a much smaller proportion

when we're buying a jacket, and a tiny fraction when we're picking up a new television.

- Range effects are intimately related to the idea of reference dependence. Outcomes are good or bad not based on some absolute value, but on their relative value compared to some reference point. We reset our sense of value so that things better than the reference point are seen as good, and things worse than the reference point are seen as bad. Range effects involve changing the scale.

Psychological Effects

- Range effects may seem like yet another bias in our decision making, but they aren't specific to decision making. They affect what we perceive, how we move, and even what we remember. They arise because of a basic feature of our biology—how we're set up to deal with information across different scales.

- In the mid-19th century, Ernst Weber, one of the founders of psychology, was interested in range effects. One of his most famous experiments was also one of the most simple. He brought people into his laboratory and then had them lift one object and then another, and then he asked them to guess whether one was heavier. He found that the difference in weight needed to guess correctly was a constant proportion of the weight.

- For example, people could reliably distinguish a two-pound weight from a two-pound, one-ounce weight, but they couldn't tell the difference between a 20-pound weight and a 20-pound, one-ounce weight. At that larger range, the difference would need to be about a half of a pound or so to be noticeable. When lifting two objects, people can tell which one is heavier if they differ by about two or three percent in weight.

- This phenomenon has come to be known as Weber's law: The difference needed to discriminate two stimuli, what psychologists call a just noticeable difference, is a constant proportion of their magnitude.

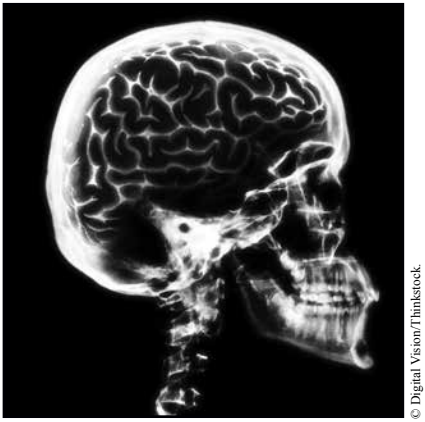
- Weber's law seems to be practically universal. It holds for the weight of things we lift, the brightness of things we see, the loudness of things we hear, and even for our ability to represent numerical quantities. Just as a difference of five ounces matters much more when lifting 10-ounce weights than when lifting 10-pound weights, a difference of five dollars matters much more when spending 10 dollars than when spending 100 dollars.

- Weber's law captures the key feature of range effects. When we perceive, remember, or make decisions about small quantities, the range of potential values is small, and our judgments can be very precise. Small differences matter, when we're dealing with small ranges.

- But when we must deal with large quantities, there is a correspondingly larger range of potential values. That makes our judgments much less precise. We don't notice small differences against that backdrop. Once our range expands, differences need to be much larger to matter for our decisions.

Neural Effects

- Why are range effects so ubiquitous? Our brains face the challenge of dealing both with very small quantities and with very large quantities. Visual perception has to work for dark starlight and for bright sunlight, and our decision making has to work for cups of coffee and for sports cars.



The neurons in our brains send electrical signals to each other in order to make sense of the world.

- So how do our brains represent things both small and large? Recall that the basic units of information processing in our brains are

neurons—cells that communicate by sending electrical signals to each other. Most neurons can fire in a pretty limited range. They can fire electrical signals slowly, perhaps every second or so, or they can fire rapidly, perhaps 100 times per second.

- If you are outside at nighttime, neurons in your visual system can represent very dark objects by firing slowly—once a second—and represent very bright objects by firing rapidly—100 times a second. The brain's visual system is much, much more complex than this simplified example, but the basic principle holds.

- When you change from starlight to bright sunlight, there's about a million-fold change in the absolute intensity of the light. But your neurons can't suddenly start firing a million times per second; that's not biologically possible. They need to work within the same range as before, firing one time per second to 100 times per second. The same biological range needs to account for a much larger stimulus range.

- This idea is fundamental to everything we perceive—not just money, but everything else, too. Our brain adapts from processing small quantities to processing big quantities by changing the scale. That has a cost: When we move from small to big, we lose precision. A dollar seems meaningful for a cup of coffee, but it doesn't matter for a television. That's the essence of a range effect.

Economic Decision Making

- A meaningful difference in some quantity is inversely proportional to its range. Differences become less meaningful as quantities get bigger. This description of range effects sounds a lot like the idea of diminishing marginal utility for money. This idea, which is a bedrock concept in economics, was first articulated in the 18th century by Daniel Bernoulli.

- Diminishing marginal utility for money is a straightforward consequence of a much deeper phenomenon: Small differences don't seem meaningful when dealing with large amounts. Ten

dollars matters more to someone who has almost nothing than to someone who is a millionaire many times over.

- There's a second implication of range effects, though—one that helps us understand a particularly thorny problem for behavioral economics. Suppose that your friend offers you a coin-flip gamble: If the coin lands on heads, your friend will give you 11 dollars, and if it's tails, you will give your friend 10 dollars. Some people will accept this offer, but most won't. Most people turn down gambles like this unless the potential gain is twice as big—or bigger—than the potential loss.

- The economist Matthew Rabin noted that if you turn down that gamble, it implies that the utility for the 11th dollar above your current wealth state is considerably less than that of the 10th dollar below your current wealth state. How much less? 10 divided by 11, or about 90 percent. Stated another way, turning down this gamble implies that the value of a dollar diminishes by 10 percent over a range of 21 dollars.

- If this were true—if the value of a dollar diminishes by 10 percent for every additional 11 dollars over what you have now—then very strange things would happen. The value of the 100th dollar over what you have now would only be 42 cents. The value of the 500th dollar over what you have now would only be about one cent. And the value of the 1,000th dollar over what you have now would be only one-hundredth of one cent.

- This rate of diminishing marginal utility is a problem; it doesn't make sense. Money is worth less to us when we have more, but it's not the case that additional money would become essentially worthless if we had 1,000 dollars more than we have now.

- The problem arises because people shouldn't be risk averse over small stakes. The coin flip just described is a pretty good gamble—you should take it. And, if you are risk averse over small stakes, then you should be really, really risk averse over large stakes. You

shouldn't turn down a coin-flip gamble—winning 11 dollars against losing 10 dollars—while also being willing to trust your retirement funds to the stock market.

- Why do people behave this way? Think about this phenomenon as a range effect. Suppose that we do recalibrate our value for money to fit the current range. We take the same scale and shrink it for small decisions and stretch it for big decisions. That implies that the value of money diminishes faster when we're dealing with small amounts—like the coin flip gambles—but much, much more slowly when we're dealing with large amounts—like our retirements.

- There are no big decisions. We use the same sort of processes to deal with quantities both large and small. But when we adapt to deal with large quantities, we lose precision in dealing with small quantities. That's the basic idea of a range effect. Our sense of a meaningful difference in some quantity is inversely proportional to its range.

Minimizing Range Effects

- We can take steps to avoid range effects—or at least minimize their unwanted influence on our decisions. First, begin with small decisions. If you begin with a decision involving large amounts of money, then you may lose the ability to make good decisions about smaller amounts of money. By beginning with smaller decisions, and moving up to bigger decisions later, you'll avoid losing perspective on small but still important decisions.

- Second, avoid undesirable options that exaggerate range effects. Considering a high-priced option when deciding among various options, even when you know it's out of your price range, will make differences in price seem less important. Marketers know this, so they ensure that there are high-priced alternatives in many decisions, even if they don't expect customers to choose them.

- Finally, force yourself to recalibrate. Don't lose perspective when making what seem like big decisions. In other words, don't think

about seemingly big decisions in isolation. Instead, force yourself to think about how else you could use the money that you would save if you went with the less expensive option.

Suggested Reading

Allon, Federgruen, and Pierson, "How Much Is a Reduction of Your Customers' Wait Worth?"

Rabin, "Risk Aversion and Expected-Utility Theory."

Questions to Consider

1. How could marketers take advantage of range effects to push consumers toward a higher-priced item?

2. What strategies could you use to minimize those marketing techniques in your own decision making?

Probability Weighting

Lecture 6

Why is it so difficult for us to judge the probability of events? And why do we fail to use probability information effectively even when it is given to us? To gain answers to these questions, you will need to explore the phenomenon of probability weighting, which describes the bias people show when working with probability. This phenomenon was, along with reference dependence, one of the two main advances in prospect theory—and, thus, probability weighting is one of the foundational concepts in behavioral economics.

Probability

- Probability is the likelihood that some defined event will occur. There are two common ways in which we describe something's probability. The first is in terms of percentages: There's an 80-percent chance of rain tomorrow. The second is in terms of frequency: Four out of five dentists recommend flossing daily.

- Probabilities are only meaningful to the extent that the events they describe are well defined. If you flip a fair coin, there is a 50-percent chance that it will land heads and a 50-percent chance that it will land tails. Those two events are exclusive—you can either flip heads or tails, but not both—and exhaustive, such that their two individual probabilities sum up to exactly 100 percent.

- Many other real-world events are similarly well defined. But many other sorts of events aren't well defined. Sometimes that's because of imprecision in the stated probabilities. An often frustrating example is weather forecasting. What is meant by a 50-percent chance of rain? The single probability of a 50-percent chance of rain could describe any of a very large set of potential events, only some of which might mean that you will need an umbrella.

- Behavioral economists refer to the way in which objective probabilities are transformed into subjective influences on a decision as probability weights. When we say that some factor "weighs heavily" on our decision, we mean that an objective difference in that factor has outsize influence compared to other factors. Probabilities that are overweighted are treated as more important than they should be, and probabilities that are underweighted are treated as less important than they should be.

- A rational decision maker should assign probability weights to different events in a manner that is both consistent and complete. Just as 50 percent is twice as likely as 25 percent objectively, consistency requires that 50 percent seem twice as likely as 25 percent subjectively so that twice as much weight is given to 50 percent in a decision. Completeness requires that the total probabilities for all possible events add up to 100 percent—not more and not less.

The Availability Bias

- Research has shown that although the price that people are willing to pay for insurance *should* be proportional to their subjective probability of needing that insurance, those subjective probabilities are distorted and inconsistent.

- Why are our probability judgments so distorted? One thing you cannot do is rely on your personal experience. Instead, you have to estimate the probability of a very rare event by constructing scenarios in your mind about what might happen. If you bring to mind a vivid scenario about an event, it will seem more real and, thus, more probable. This phenomenon has been given several names, but it is typically called the availability bias.

- This seeming irrationality in our behavior isn't just a minor inconsistency, the sort of thing that shows up in laboratory experiments and breathless science journalism. It has real-world importance.

- Our biases will affect some sorts of probability judgments more than others. Crimes that are rare but very vivid are seen as more common than they really are—so that they can draw resources away from crimes that are more common but less vivid. In many cases, resources are devoted more to very rare and vivid social problems compared to more common problems.

Probability Weighting

- For each objective probability—from one percent to 100 percent—we want to know the subjective probability weight. When we make decisions, do we treat a one-percent chance just like one percent, or like something else?

- Events that could happen but aren't likely—low-probability events—can be defined as probabilities up to about 25 percent. Low-probability events tend to factor more into decisions than they should. That is, an event that has an objective one-percent chance of occurring could subjectively seem like it has a five-percent chance of occurring.

- We overestimate the likelihood of these low-probability events. In general, the smaller the probability, the more we overestimate its likelihood. For example, people who play the lottery are often optimistic about winning. However, the odds of a single ticket winning the largest, most popular U.S. lotteries are on the order of one in 175 million.

- The mathematics used to calculate the probability of lotteries in terms of time—along with the idea of expected value of a decision—were formally described in 1654 by the mathematician Blaise

The odds of winning the lottery are not good, but people who play are optimistic.

Pascal. The probability of a single ticket winning a Mega Millions lottery is almost identical to the probability of randomly choosing one single second from all the years, days, hours, and minutes since 1654 and picking the very second that you were born.

- But the overestimation of probabilities does not completely explain the popularity of lotteries. There are at least two other factors that contribute. One factor comes from the way our brains process rewards. The brain's dopamine system doesn't simply respond to rewards themselves; it responds to signals about future rewards, which can lead to anticipation of what could occur.

- The sense of possibility—the fantasies about what we can do with our winnings—can be very motivating, and it isn't necessarily irrational to spend one dollar on a ticket in order to have those feelings of anticipation.

- Also important are the social aspects of playing the lottery. People play in groups and discuss the upcoming jackpots with their neighbors, and those social factors can be powerful motivators.

- Events of intermediate probability, from about 25 percent to 75 percent, are those that might happen—or they might not. Within this range, the probability weighting function flattens out, meaning that a change in objective probability doesn't have that much subjective effect.

- For example, suppose that you go to your primary care physician and you are told that, because of your genetic profile, you have a five-percent probability of contracting a rare form of cancer in the next five years. There is a drug treatment that is expensive and has side effects, but it will eliminate any chance that you will develop this cancer, bringing your probability of cancer from five percent down to zero percent. Do you begin the drug treatment?

- When faced with this sort of scenario, people tend to be willing to undergo treatment; going from a five-percent chance to a zero-

percent chance of cancer seems pretty dramatic. But suppose that your genetics indicate that you actually have a 60-percent probability of getting cancer but that the same drug treatment could reduce your probability down to 55 percent. You'll incur the same expense and face the same side effects for a change from 60 to 55 percent. Do you begin the drug treatment?

- This situation is much harder for most people. The difference between 60 and 55 percent seems pretty minor; it doesn't seem like the sort of change that would be worth taking on an expensive and painful course of treatment.

- Changes in probability in this medium-probability range are not irrelevant; they just have less subjective impact than at lower or higher probabilities. As a rough guide, within this middle range, for every two-percent change in objective probability there is slightly less than a one-percent change in subjective probability.

- High-probability events, which are above about 75 percent, should happen, even though there is a chance that they might not. Probabilities in this range are essentially the mirror image of medium-probability events: People underestimate the chances. An event that should happen with an objective 90-percent probability might seem subjectively like only a 75-percent chance, while an event that should happen with 99-percent probability might seem subjectively like about 95 percent.

- For many decisions, this implies that people become more conservative than they should when the odds are in their favor. In civil court cases, plaintiffs might settle for a lesser amount even though they have a very strong case; they underestimate their chances of winning. This influences our medical decision making as well; people often seek out unnecessary treatments to deal with a medical challenge that has a good prognosis.

- These three probabilities—low, medium, and high—combine into the probability weighting function of prospect theory. We overvalue

low-probability events that could happen, undervalue high-probability events that should happen, and are largely indifferent to the probabilities of events in the middle. Our subjective sense of probability doesn't match the objective reality.

Dealing with Probabilities

- Our judgments of probability are not accurate; they are systematically biased. They are biased because we don't have access to the true probabilities—we don't know whether we'll need insurance, for example. Instead, we estimate those probabilities when we need to. We construct stories about what could happen, based on our memories of past history and our reasoning about similar events.

- You can't eliminate these biases, but you can modify how you approach a decision, changing the very way in which you construct probabilities. The following are two tools for changing how you deal with probabilities.

- First, use the availability heuristic to your advantage. People tend to overestimate the likelihood of some event when it is relatively easy to create vivid stories. Therefore, if you want to reduce the chance that you'll be influenced too much by a rare event, think about the event in a way that makes it less vivid. Distance yourself from the event; imagine that you were advising someone else. By dampening our internal storyteller, we can improve the accuracy of our judgments for low- and high-probability events.

- To deal with medium-probability events, use a second tool: Think about probability in terms of frequency—for example, out of every 10 people who take this drug, two of them avoid a significant illness, and you might be one of them. By moving away from the abstract probabilities and emphasizing concrete individual cases, the frequency representation calls attention to the key fact: There are people who benefit from this course of treatment.

Suggested Reading

Johnson, Hershey, Meszaros, and Kunreuther, "Framing, Probability Distortions, and Insurance Decisions."

Tversky and Fox, "Weighing Risk and Uncertainty."

Questions to Consider

1. Under what circumstances are people most likely to purchase insurance, based on the phenomenon of probability weighting?

2. Why might people be less interested in taking steps to help prevent common medical conditions than to prevent uncommon medical conditions?

Risk—The Known Unknowns

Lecture 7

In this lecture, you will consider what happens when people have to trade off probabilities of better and worse outcomes and more certain events as you explore one of the deepest and most important concepts in behavioral economics: risk. We can't eliminate risk, and we shouldn't avoid risk. However, with the right approach and the right mindset, we can manage risk. In this lecture, you will learn the importance of seeking a healthier attitude toward risk.

What Is Risk?

- In an economic context, a decision involves risk when it can lead to more than one outcome, when those outcomes have different values, and when the probabilities of those outcomes are known or can be estimated.

- This economic definition doesn't exactly match all of the ways in which we use risk in daily conversation. For example, we describe real-world behaviors as risky if we might get hurt doing them—like skydiving—and we describe our investments as risky when we might lose money—like purchasing stocks. However, a decision can be risky even if nothing really bad can happen.

- Risk is also different from ambiguity. A decision involves risk when the probabilities of its outcomes are known or can be estimated. We know, for example, the probabilities of flipping heads or tails. We can estimate the probabilities of getting lower and higher interest rates based on recent fluctuations in mortgage rates. When we can't know or estimate the probabilities of an outcome, then the decision is said to involve not risk but ambiguity.

Risk Aversion

- For many sorts of economic decisions, we can describe people's choices as being risk averse, risk neutral, or risk seeking. Most

common are risk-averse choices; that is, where people prefer a safe option over a risky option with equal expected value.

- A utility function determines how much subjective value we get from different amounts of an objective quantity, like money. It was recognized long before the advent of behavioral economics that people's subjective value for money—and most other things—showed diminishing marginal utility.

- In traditional models, this was described in terms of wealth states: A dollar is worth more to someone who has nothing than to someone who has a million dollars already. Prospect theory moved away from wealth states but kept the idea of diminishing marginal utility: The difference between gaining one dollar and two dollars is more than the difference between gaining 1,000 dollars and 1,001 dollars. This sort of utility function leads to risk aversion—at least as a broad principle.

- Which would you rather have: a sure 1,000 dollars or a coin-flip gamble between zero dollars and 2,001 dollars? Intuitively, this seems like an easy choice to most people: Take the sure 1,000 dollars. But why is that choice so easy? It's not because the 1,000 dollars is a better choice, at least by expectation; if anything, you'd expect to earn very slightly more, on average, by choosing the risk option.

- This is an easy choice because of diminishing marginal utility. The subjective difference between zero and 1,000 dollars seems much larger to us than the subjective difference between 1,000 and 2,001 dollars—so we choose the safer option and avoid the chance of getting zero dollars. Therefore, provided that someone shows diminishing marginal utility for money, he or she will be naturally risk averse.

- This is only part of the story. People are often risk averse when making small decisions, such as those involving a few tens of dollars. Even slight risk aversion over such small stakes implies massive risk aversion over large stakes, as shown by the economist

Matthew Rabin. We can't explain real-world risk aversion just by diminishing marginal utility.

- To see what else might be needed, let's return to loss aversion, which means that economic losses influence our decisions more than economic gains—on average, about twice as much. This phenomenon affects the way people think about risky decisions. If people think about risky options as involving losses and gains, from the reference point of the safe option, their subjective sense of potential loss can readily outweigh their sense of potential gain.

Risk Seeking

- Risk-seeking behavior is often inefficient. If someone is truly risk seeking over monetary gains, then he or she can be exploited. He or she will be willing to take bad bet after bad bet, much like the pathological gambler who can't walk away from the table.

- But what about monetary losses? Do people tend to be risk averse or risk seeking when faced with decisions that involve risky losses versus sure losses? This is a much harder question. A moment's intuition might suggest that if people are more averse to losses than to gains, then they might be even more risk averse for decisions involving losses.

- Consider this question from a behavioral economics perspective. Prospect theory proposed that people have diminishing marginal utility for both gains and losses. That is, the difference between losing zero dollars and losing 100 dollars might be pretty bad, but the difference between losing 1,000 dollars and losing 1,100 dollars isn't anywhere near as great.

- So, what does this fact mean for decisions involving risk? People tend to be risk averse when making decisions about potential gains, but people tend to be risk seeking when making decisions about potential losses.

How Do People Think about Risk?

- Are our risk attitudes a stable personality trait, like extroversion, that shapes all of our choices? The decision scientist Elke Weber and her colleagues explored this question by asking participants questions about how often they engaged in different sorts of risk-taking behaviors. The questions involved investment behaviors, recreational behaviors, social behaviors, gambling behaviors, health-related behaviors, and ethical behaviors.

- If attitudes toward risk represent a stable personality trait, then people who frequently engaged in one type of risky behavior would be more likely to engage in the other types of risky behavior. But that's not what Weber found.

- Instead, these different risky behaviors formed separate categories that were not strongly correlated. Knowing that someone is risk averse in his or her investments, for example, doesn't tell you much about whether he or she is averse to risky social behaviors or to risky recreational activities.

- Why aren't these different risky behaviors related? You might not engage in a risky behavior because you are intrinsically risk averse, or it might be because you don't perceive any benefit from an activity or because you overestimate the risk of something negative happening as a result.

- When Weber and colleagues asked their participants about perceived benefits and perceived risks of each activity, they found that perceived benefit and perceived risk explained most of the differences between categories. So, someone who is risk averse in their investments but risk seeking in their recreation might overestimate the probability of a market crash, while deriving more benefit than other people from extreme sports.

- There are two key findings from this research. First, there's essentially no such thing as a purely risk-averse or risk-seeking individual; the same person can have very different tendencies for

different types of decisions. Second, differences in how we each approach risk in different aspects of our lives are driven by our perceptions—of how much benefit we'll gain and of the probability of a bad outcome.

Managing Risk

- Risk isn't necessarily bad. Investors who minimize risk earn less money, on average, than those who are willing to take on risk. So, our goal shouldn't be to avoid risk, but to manage it. There are two basic rules that you can follow in order to manage risk. The first is simple: Diversify.

- The Nobel Laureate economist Harry Markowitz developed an elegant approach to managing investment risk. His central idea was that an optimal portfolio should contain assets that are not correlated—that do not tend to move together over time. New investments won't reduce the risk of a portfolio if they are largely correlated with existing investments, so it doesn't necessarily improve your portfolio's diversity when you buy into a new hot stock or take on yet another large-cap mutual fund.

- For the sorts of investments most people make, this approach prioritizes one type of investments: broad mutual funds that reflect the overall performance of the larger financial markets. That doesn't mean such investments are the only reasonable strategy for retirement, but there are indeed very strong reasons to value investment diversity when trying to manage risk.

- The second rule is also simple: Avoid regret. In other words, you should think about risk a bit differently—so that bad outcomes don't lead to regret. It's often good to regret our mistakes so that we learn and make better choices next time. But that regret does us little good when investing. Because high-reward investments tend also to be of high risk, it is good if we can dampen down our feelings of regret when necessary.

- One effective approach for doing this comes not from behavioral economics but from clinical psychology. Psychologists have long been interested in strategies that help people dampen down their emotional reactions; such reappraisal strategies can be very helpful when dealing with adverse events that are outside one's own control.

The goal of investors is to manage their risk—not to avoid it. On average, those who minimize risk earn less money than those who take on risk.

- Researchers have explored a particular strategy called thinking like a trader. To do this, think of yourself as a dispassionate observer of your own investment portfolio. Each of your investments is part of a larger whole, and any one of your investments might go up or might go down on any day.

- Expand your time horizons: Don't think about the day's or month's market results, but instead about your prudent, well-considered approach toward managing risk. Each decision you make is part of your larger strategy. It isn't even meaningful to regret one decision or one day's market fluctuation by itself. The larger strategy and long-term results are what matter.

Suggested Reading

Bernstein, *Against the Gods*.

Reyna and Farley, "Risk and Rationality in Adolescent Decision Making."

Questions to Consider

1. Why is diversification an effective tool for minimizing risk?

2. What is the difference between risk aversion and loss aversion?

Ambiguity—The Unknown Unknowns

Lecture 8

Decisions when faced with missing information, or ambiguity, can be some of the most difficult to make. You know that a good decision could be made with the right information, but you just don't have it. In this lecture, you will learn about three sorts of situations that lead to ambiguity aversion: hidden information, asymmetric knowledge, and unfamiliar contexts. In all three situations, we tend to avoid choice options where information is missing and where we feel less competent. And, in all three situations, the presence of ambiguity means that we treat the decisions differently than if there was only risk.

Risk versus Ambiguity

- In his book *Risk, Uncertainty, and Profit*, economist Frank Knight's key insight is that there are two distinct types of uncertainty. Measurable uncertainty—decision where the probabilities of potential outcomes are known or could be estimated—was called risk.

- There was another type of unmeasurable uncertainty. He argued that there are decisions that we know could lead to different outcomes, but for which we do not know the probabilities and, importantly, cannot estimate those outcome probabilities. We don't know—and cannot readily estimate—what we don't know. Knight referred to this second type of decision as involving uncertainty, and economists sometimes call it Knightian uncertainty. It is also referred to as ambiguity.

- When Knight advanced his idea that there were two distinct forms of uncertainty, he did so based not on data but on his own intuitions. The idea of unmeasurable uncertainty made sense to Knight—and helped his arguments—but he didn't have any evidence that it actually existed.

- That evidence didn't come until 1961, through the efforts of a doctoral student in economics named Daniel Ellsberg, who sought to identify the circumstances under which people might behave as if influenced by ambiguity instead of just risk. He developed a thought problem that has since become known as the Ellsberg paradox, which is paraphrased as follows.

- Suppose that you are walking through your state fair toward a prize redemption station. You've just won two tickets that each give you some chance to win large prizes. You walk up to the barker running the station. He looks at you, smiles, and explains how his game works.

- He points to a large opaque urn in front of him. The urn has a hole in the top through which you can reach, but you can't see anything inside. "In this urn," he says, "are 90 Ping-Pong balls. Thirty of those balls are painted red, and the rest are either black or yellow—I can't tell you how many of each."

- Then he says, "For your first ticket, you get to call out a color and reach into the urn. If you pull out the color you just called, then you'll receive 100 dollars. What color do you call?" If you are like most people, you'd call out "red." You'd rather go with the known probability of one in three instead of some unknown probability for the other colors. Suppose for a moment that you didn't play this game right away, but instead waited to let the barker explain what you could win with your other ticket.

- "For your second ticket, I'll make the game even better for you: Yellow balls are automatic winners. So, you just have to call out either 'red' or 'black' and then reach into the urn. If you pull out the color you just called or you pull out a yellow ball, then you'll receive 100 dollars. What color do you call?"

- If you call out "red," you'll win with any of the red and yellow balls; you know that there's at least 30 such balls, but you don't know exactly how many. However, if you call out "black," you

know that black plus yellow gives you 60 potential winners out of 90 balls. So, if you are like most people, you'll call out "black."

- Let's distill these two decisions to their essence. You know that there are 30 red balls and 60 black or yellow balls, with unknown probabilities of each. In both cases, you are given a meaningful incentive to choose the color that seems most likely. If you think that there are more red balls than black balls, then you should pick red in both cases.

- If you think that there are more black balls than red balls, then you should pick black in both cases. No matter what, though, you shouldn't switch your choices. But almost everyone does—and that's the Ellsberg paradox. The reason people switch their choices in these two decisions—going from red to black—is because of ambiguity aversion: People don't want to bet on situations in which the probabilities are unknown.

Evoking Ambiguity Aversion: Hidden Information

- Consider a simple economic decision. Suppose that you could pay money to play a simple coin-flip game: If the coin is heads, you win 100 dollars, and if it's tails, you win nothing. How much would you pay to play that game?

- This decision involves just risk, not ambiguity. You know the outcomes and their probabilities. So, your willingness to pay depends just on your risk aversion in this gamble. If you are risk neutral, you'd pay the expected value of the game, which is 50 dollars, but if you are slightly risk averse, like most people, then you might pay a bit less—maybe 45 dollars.

- Let's introduce ambiguity into this decision. We can replace the flip of a coin with a draw from an Ellsberg urn with 100 balls, some of which say "win 100 dollars" and some of which say "win nothing," but you don't know the probabilities. Let's assume for the moment that the urn—like the coin—is fair. There could be anywhere from zero to 100 winning balls in that urn, with equal probabilities of

any number. This is what statisticians call a uniform probability distribution. You just don't know what that number is.

- How much would you pay to play this second game? When people play games like this in a laboratory, they aren't willing to pay 50 dollars, even though that's the expected value of this second game, too. They aren't even willing to pay as much as they would for the similar coin flip. Instead, the average willingness to pay is much lower, perhaps 25 dollars or even less. People don't treat this second situation—where the probabilities are unknown—as just another risky decision. Something's different about the decision when ambiguity is involved.

- Research shows that our brains recognize when we don't have all of the available information about probability—the unknown unknowns—and our brains construct rules that help us work around that missing information. That constructive process isn't necessary for risky decisions—the known unknowns.

Evoking Ambiguity Aversion: Asymmetric Knowledge

- The second situation that leads to ambiguity aversion is asymmetric knowledge, which means that one of the parties in some transaction knows something that the other parties do not. You've experienced this if you've ever haggled about the price of a handcrafted artwork, sought a second opinion about a medical procedure, or tried to buy a used car.

- Similar asymmetries arise in any situation where knowledge relevant to some decision is possessed by one person, but not others. We don't like asymmetric knowledge. We don't like the ambiguity it creates, and we want to withdraw from the decision, walking off of the used car lot and away from a potentially untrustworthy partner.

- One common example of an asymmetric knowledge situation is purchasing insurance. Insurance exists as a consumer product for two key reasons. The first reason is that the odds are in the insurer's

favor. The insurer can estimate the risks associated with a particular sort of insurance policy. This allows the insurer to set the premiums sufficiently high so that people who purchase a specific sort of insurance pay in more through their premiums, on average, than the insurers have to pay out in claims.

Insurers estimate the risks associated with an insurance policy. They can remain close to being risk neutral by speading out their risk over many policyholders.

- So, why would any rational person buy insurance? The answer comes from the second reason: Policyholders are more risk averse than insurers. Each of us who owns insurance of some form is at least somewhat risk averse. We don't want to face the catastrophic consequences of a severe illness or a complete loss of our home or car, so we are willing to pay more for our insurance policy than its expected cost to the insurer. The insurer spreads out its risk over many, many policyholders, so it can be close to risk neutral and still make money.

- When thinking about insurance as just involving risk, the decisions of the insurers to decline any coverage just doesn't make sense. But, insurance involves more than risk, as shown in an elegant study by the economist Nathaniel Hendren, who realized that applications for health insurance policies involve information that is asymmetric—but not in the usual way. For health insurance, the policy applicant has considerable information that just isn't available to the insurer.

- Hendren's key insight was that insurance markets fail for high-risk individuals because those individuals know something about their health that the insurers do not. Faced with that private information,

the insurers become ambiguity averse, leading to a market that is worse off for individuals, insurers, and the public interest alike.

Evoking Ambiguity Aversion: Unfamiliar Contexts

- The third and final way ambiguity influences decisions is unfamiliar contexts. We prefer to make decisions by drawing conclusions from our own knowledge, as imperfect and probabilistic as it may be. Even if that knowledge isn't sufficient to help us make a good decision, it still seems better than the ambiguity associated with an unfamiliar context.

Minimizing the Effects of Ambiguity

- Our aversion to ambiguity is often well justified; ambiguity arises in some of the most difficult decision problems we face. There is a two-step approach that can help us think about ambiguity, if not always deal with it.

- In a first step, ask yourself, what information is missing? If you cannot identify any missing information, then the situation may simply involve risk, and you can make the decision using any of the tools discussed throughout this course.

- However, if there is some missing information, then the situation likely involves ambiguity, and you should proceed to a second question: How could I get the missing information? Identify a path, if possible, for converting your decision from ambiguity to risk. But, in some cases, despite your best efforts, you won't get all of the information you need.

Important Terms

Knight, *Risk, Uncertainty, and Profit*.

Post, Van den Assem, Baltussen, and Thaler, "Deal or No Deal?"

Questions to Consider

1. What is ambiguity, and how is it different from risk?

2. Why might people be so averse to ambiguity in their decisions?

Temporal Discounting—Now or Later?

Lecture 9

This lecture moves from decisions about probability, risk, and ambiguity to decisions about time: Should we spend now, or save for the future? Such decisions present a particularly challenging form of uncertainty, one that we all face when dieting, investing in our education, or saving for retirement. In this lecture, you will learn about why decisions involving time are so challenging and how we can make better decisions about our future.

Temporal Discounting

- To an economist, the term "discounting" means a reduction in value. Therefore, "temporal discounting" means a reduction in value because of the anticipated passage of time.

- Suppose that you walk into a behavioral economics laboratory to do an experiment on temporal discounting for money. The experimenter gives you a choice between two options that differ in their reward value and timing, and you just report what you prefer. Which would you rather have: 100 dollars today or 110 dollars in six months?

- In laboratory experiments, most people prefer receiving 100 dollars today—the smaller, sooner reward. This implies that the value of money diminishes over time; we'd rather have less now than more later. Let's change the question. Which would you rather have: 20 dollars today or 200 dollars in one month? Now, most people choose 200 dollars in one month; they pick the larger, later reward.

- In the laboratory, we can ask people a series of these questions, systematically varying the reward values and timing, and then estimate a mathematical function, called the temporal discounting function, that describes how time influences the subjective value of money.

- When we measure people's temporal discounting in the laboratory, the most obvious result is that people vary tremendously in their patience. Some people discount money very slowly, such that they have equal value for 48 dollars now and 50 dollars in six months. Others discount very, very rapidly. They have equal value for 20 dollars now and 50 dollars in just one month.

- Behavioral economists have argued that people engage in a sort of mental accounting for their financial decisions—they assign decisions to different mental accounts and apply different rules to each account. The retirement savings and the money earned in the laboratory reflect two different mental accounts.

- It would be much more efficient for us to apply the same rules across all such accounts so that we aren't too impulsive in one setting and too patient in another. However, that turns out to be very difficult.

Why We Discount

- There are at least three explanations for why rewards are worth less in the future than they are in the present. First, delayed outcomes can also be risky outcomes. Waiting to receive a reward carries risks. The promise of a future reward might not be kept. Our personal circumstances might change—we might step in front of a bus tomorrow, or we might win the lottery. The longer the delay, the greater the risk and, thus, the less a future reward should be worth. However, we can't explain away temporal discounting as just a natural response to risk.

- A second explanation is more psychological: Temporal discounting arises from temptation. People tend to discount primary rewards like food and juice much more rapidly than money. Moreover, people who find a particular type of reward especially tempting—like those who report loving candy, chocolate, or chips—show faster discounting for that reward than other similar rewards. However, temptation doesn't explain why we show such high

discounting for money, especially when we don't desperately need that money right now.

- There is a third explanation that is a bit subtler than the other two. Think of, for example, a 25-year-old single male in the United States who is just beginning to save for retirement. Every dollar saved for retirement is taken away from his 25-year-old self—that money is not available for whatever activities he values right now. Instead, it is aside for the as-yet-unknown desires of his 65-year-old self.

- Perhaps his 65-year-old self will like to travel, or will want to support charitable causes, or will need long-term medical care. He doesn't know—and cannot know—what his 65-year-old self will use the money for. He just knows that it is a good idea to reserve some of his current money for his future self.

Preference Reversals

- The first of three key anomalies in temporal discounting behavior is preference reversals, which are flips in preference from one reward to another as time passes. Consider the following choice. Which would you prefer: 100 dollars now or 105 dollars a week from now? Many people find this to be a pretty easy choice; they'd rather have the smaller but sooner 100 dollars.

- Let's change the dates. Which do you prefer: 100 dollars in 52 weeks or 105 dollars in 53 weeks? Now, this seems like a very easy choice to almost everyone: They'd rather have the larger, later 105 dollars.

- These two situations only differ because of the passage of time: The second scenario just happens one year later than the first. However, people choose differently in the two situations, choosing the smaller, sooner reward when it is near but the larger, later reward when it is distant.

- Think about what that implies about people's preferences. Someone who prefers 105 dollars in 53 weeks would have to wait, and wait,

for their reward to be delivered. Then, after a year had passed, they would then be in exactly the situation of the first question, and they'd now prefer to get the 100 dollars now instead of waiting another week. Their preferences would reverse, just because of the passage of time.

- Preference reversals like this imply that people discount rewards faster when they are near in time. Thus, they aren't consistent with the constant discounting of an exponential function. But they are consistent with the rapid short-term discounting of a hyperbolic function. There is a consensus that temporal discounting should follow an exponential function, but that it actually follows a hyperbolic function, in most settings. So, we may want to be rational, but we're really impulsive.

Sequence Effects

- A second anomaly in intertemporal choice is that of sequence effects. By itself, temporal discounting implies that we should want to receive good outcomes as soon as possible, when they are most valuable to us. Often, that is true, but there are specific situations in which we'd instead prefer to wait for a good outcome.

- Suppose that you have won gift certificates for dinners at three local restaurants. You're familiar with all three. One is basically a no-frills English pub. The second is the fanciest Italian restaurant in town. The third is a casual French bistro that is intermediate in price and quality. Over the next three weekends, you can dine at these three restaurants in any order you choose. Which do you pick for your first weekend? Second? Third?

- There's no right answer, and people may have personal reasons for picking these in any order. However, people do show a strong general tendency for an ascending sequence of quality: They'd first go to the pub, then to the casual bistro, and then finally to the fancy restaurant. Temporal discounting can't explain this effect, because the most valuable option is saved for last.

- Why do people save the best option for last? People want to have that feeling of anticipation, which is an extremely powerful motivator for our decisions. Anticipated gains lead people to purchase lottery tickets that have astronomically low chances of winning. Anticipated regret pushes people away from risky investments, even when those investments are strongly in our interest. Feelings of anticipation can override the normal decrease in value that comes with temporal discounting.

Dread

- Finally, there's dread, that feeling you get when you know that something bad will happen. You know it's coming, it's going to be unpleasant, you can't avoid it, and you just want it over with. Even though dread seems more like a feeling than an object for scientific study, behavioral economists and neuroscientists have sought to understand its causes. One approach in the laboratory involves the delivery of moderate electric shocks.

- If you were in one of these experiments, the researchers would bring you into the laboratory, sit you down in a comfortable chair, and then attach an electric lead to your forearm. They'd then give you a set of calibration shocks to determine your maximum pain tolerance—the strongest shock you can bear. Then, they'd give you choices between pairs of shocks that differ in their strength and timing—for example, between 10 percent and 90 percent of your maximum pain tolerance and with delays between one and 30 seconds.

- You might think that people would want to put off the aversive shocks as long as possible. Or, at the least, they'd just choose whatever option gives them the least pain overall. But that's not what happens. Many people actually prefer to get a larger shock immediately instead of waiting a long time for a smaller shock. Such behavior runs exactly opposite to standard temporal discounting models.

- The neuroeconomist Greg Berns used functional MRI to examine brain responses while people were awaiting these sorts of delayed shocks. He found that while people waited for the upcoming shocks, those people who showed the most dread also showed an anticipatory response in brain regions that process pain; it was as if their brains simulated the upcoming negative experience. That waiting period—that feeling of dread—is itself aversive. People actually find the experience of dread sufficiently aversive that they are willing to take their lumps now so that they don't have to wait, and dread, any longer.

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Functional magnetic resonance imaging (fMRI) measures changes in blood flow in the brain.

Making Better Intertemporal Decisions

- There are surprisingly simple things that we can do to make better intertemporal decisions. The first of these is straightforward: Expand your time horizon. Don't think about consequences as occurring at a single moment or day, but as unfolding over a long window of time. By expanding your time horizon, you'll be more accurate in how you envision an uncertain future.

- A second rule requires a little more work: Change your reference point. Think not about delay, but acceleration. When the same decision is framed as an acceleration—giving up money to get a reward sooner—people tend to become much more patient. They don't want to give up some of their reward in order to receive it sooner. This phenomenon, which is called asymmetric discounting, provides a pretty simple tool for making more patient decisions. Just use the most patient outcome as a reference point, and frame the sooner option as being a sacrifice, not a gain.

- The final rule requires the most effort, but it is potentially the most helpful: Think about your future self. Don't just acknowledge that you have a future or that you'll have expenses later that you don't have now. Think about your future self as a person and consider that future self's needs, as explicitly as you can.

Suggested Reading

Kirby and Herrnstein, "Preference Reversals Due to Myopic Discounting of Delayed Reward."

Weber, et al, "Asymmetric Discounting in Intertemporal Choice."

Questions to Consider

1. What are preference reversals in temporal discounting, and why do they occur?

2. What strategies are effective for increasing the patience of our intertemporal decisions?

Comparison—Apples and Oranges

Lecture 10

There is now strong evidence that value isn't something we just look up from some internal table. Our brains construct subjective value when we make decisions—and even when we are just going through our daily activities. Value isn't something stable, intrinsic, or immutable. In this lecture, you will explore how people create and compare the subjective values of different options in order to make a decision. Specifically, you will consider two big ideas: constructed preferences and common currency.

Constructed Preferences

- The idea of constructed preferences contends that subjective value is something we create as needed. This idea hasn't always been well accepted in economics, but it is consistent with what psychologists now think about how memory works.

- The idea of constructed preferences can be applied to any decision situation, no matter how simple. This idea contends that we don't necessarily have intrinsic preferences that determine our choices of different goods—for example, that an apple is worth more than a dollar. Instead, we figure out what's important to us by working through the decision problem.

- This idea has been heretical to some economists; they think that people have stable and consistent preferences and that people have enough sense of their own preferences that they can look them up as needed. But this idea is consistent with how cognitive scientists now think about memory. Memories aren't looked up and processed as integrated wholes, but constructed from disparate elements at the time of retrieval.

- There are two decision biases. The first is called the decoy effect, which arises when the introduction of an unchosen option shifts what we value—specifically, biasing us toward an option that seems

objectively better than the decoy. Marketers often use decoy effects, if not always as part of a conscious plan. In addition, some political scientists have argued that decoy effects can influence elections. For example, the introduction of a third-party candidate can shift undecided voters toward one of the two major-party candidates.

- The second decision bias is called the compromise effect. In situations where there are no objectively better or worse options, people tend to compromise. They tend to pick the intermediate choice that seems like a compromise between the extremes.

- Compromise is not always in our interest. When we compromise, we don't get to take advantage of the extremes. It might actually be a good idea to pick the best-located hotel room, the cheapest bottle of wine, or the most reliable car. And, if we consistently compromise, we can be exploited. A restaurant owner can make an expensive bottle of wine's price seem more reasonable by adding a rare and even-more-expensive bottle to the wine list.

- Constructed preferences lead to biases like preference reversals, decoy effects, and compromise effects—so why do we construct value, if it leads to so many mistakes? Why aren't our preferences more consistent and stable, so that we can look them up when needed?

- There are two answers to these questions. The first answer is that these biases actually help us make decisions. You are faced with a difficult choice between two or more similar items. Those items have different advantages and disadvantages, but it is often difficult to know what's really important.

- So, if there's an option that you won't regret—either because it is clearly better than some other option or because it is a good compromise—you can choose it and get on with the rest of your life. None of these biases overrides all other factors that motivate your decision; instead, they tend to push you one way or the other when you are faced with a particularly difficult choice.

- The second answer is a bit more complicated: Our preferences are constructed because that's how our brains have to work. We don't always know what factors are going to be relevant to a decision, in part because we have to value such dissimilar things—we weigh time versus effort, we trade money for food. To do this, we have to construct a common currency for value.

Common Currency

- The economist-turned-neuroscientist Antonio Rangel, working with the marketing scientist Hilke Plassmann, has used simple decisions to understand how the brain computes value. If you were a participant in one of their experiments, you'd fast for part of the day and then come to the research laboratory—hungry.

- You'd then lie down in an fMRI scanner and view a series of familiar brand-name snacks. When each snack appeared on the screen, you'd indicate how much you'd be willing to pay for it. When the experiment ended, you'd stay in the laboratory even hungrier than before. The researchers then would choose one snack, randomly, and sell it to you for the price you were willing to pay.

- Rangel, Plassmann, and their colleagues found that a particular brain region's activation tracked how much people were willing to pay for each snack. We call that region the medial orbitofrontal cortex, an area that receives input from dopamine neurons.

- The activation of this region was greater for snacks for which people would pay three dollars than for two-dollar snacks, greater for snacks for which people would pay two dollars than for one-dollar snacks, and so on. Importantly, the activation was independent of the specific objects on which people were bidding. Two different people might prefer completely different snacks, but they would both show increased activation to the specific snacks that they found most valuable.

- Rangel, Plassmann, and others have shown that the activation of the medial orbitofrontal cortex tracks other sorts of willingness

to pay, such as how much people will pay for physical goods like wine or electronics, or how much people will pay to avoid eating something unpleasant.

- These results are consistent with the idea that the medial orbitofrontal cortex represents a common currency for subjective value—how much something is worth to us regardless of what it is. Our brains use that common currency to make decisions between different sorts of goods. Even if our brains process food using one pathway and money using another, those different pathways each feed into the medial orbitofrontal cortex so that different goods can be compared on the same scale.

Integrating Construction and Common Currency

- Subsequent research has explored whether the construction of subjective value is a relatively automatic process—whether this brain region constructs value signals even in the absence of explicit choice.

- If we show people physical goods like food or electronics in an experiment, we only get a sense of their anticipated value; the actual experienced value comes later when people consume or use the good. So, research has been conducted that looks at decisions about viewing faces.

- Human faces are perhaps the single most universally motivating visual stimulus. We love looking at faces of our family and friends, and even of people unfamiliar to us. Researchers took advantage of this bias in a two-part neuroscience experiment.

- In the first part, each participant just passively viewed faces of varying attractiveness and passively received monetary rewards. They didn't have to do anything. From this, we could examine how the brain responds to the experience of more versus less attractive faces and the experience of better versus worse monetary rewards.

When people see electronics, for example, the anticipated value of the electronics can be estimated, but when people actually use electronics, the experienced value can be determined.

- Then, in the second part, the same participant made active decisions to spend some of the money he or she had just earned in order to view attractive faces. From this, we could determine how much money they were willing to pay in order to see an attractive face.

- If subjective value is being constructed automatically, then we should be able to use brain signals generated while people look at attractive faces to predict their later decisions about different attractive faces.

- That's exactly the brain signal we found in the medial orbitofrontal cortex—the same brain region that was thought to represent a common currency across different rewards. If someone was willing to pay a lot to view attractive faces, then the brain response in that region was much greater for faces than money. But if someone would rather keep his or her money, then the brain response was greater for money than faces.

Active Construction

- Despite the additional time and energy required, constructed preferences provide an enormous advantage over something more static: They are extraordinarily flexible. What we prefer and, in turn, what we choose can change depending on the current context in which we are making decisions. When our mood shifts or when we enter a new environment, we start to prioritize new features of a complex decision, and our preferences change as well.

- This scientific background leads to specific advice for decision making. In particular, your value for something is constructed based on the questions you are asking. So, ask different questions. If you are trying to decide between two similar items, step back and ask yourself how much you'd be willing to pay for one of them. Then, ask how much you'd be willing to pay for the other. You might come to a different decision—or have different insight about your decision—by thinking about items independently rather than by only thinking about them in comparison with each other.

- If you are making a decision among a set of options, ask yourself how your decision might change if one or more of those options were just unavailable. Rule something out, for the moment, and see if your preferences shift. Are you compromising for compromise's sake? Are you influenced by an irrelevant decoy?

- You don't always know what's important to you. So, use these processes of active construction to your advantage. Use them to simulate a slightly different sort of decision problem so that you can learn more about your own preferences—whether you are valuing the right things or whether you are fixating on some minor aspect of the decision. This construction process is critical because we don't have perfect knowledge about the world, about goods we could purchase, or even about our own preferences.

Suggested Reading

Huber, Payne, and Puto, "Adding Asymmetrically Dominated Alternatives."

Payne, Bettman, and Johnson, *The Adaptive Decision Maker*.

Questions to Consider

1. How could restaurant owners use the decoy effect to increase purchases of a high-margin item on their menu?

2. What is meant by a "common currency" for decision making?

Bounded Rationality—Knowing Your Limits

Lecture 11

For many relatively simple decisions, all of us follow a compensatory process—we trade off rewards against risks, effort against time. But for complex decisions, we find a simple rule that helps us make sense of a complex situation. The use of simple rules to help make good decisions most of the time has become one of the major themes in behavioral economics. It's called bounded rationality. Our decision-making process isn't "rational," under the traditional economic definition of the term. But taking into account our limitations, or bounds, our decisions can sometimes look very rational.

Limited Computational Abilities

- The first major contributor to bounded rationality is our own limited computational abilities. A complex, powerful brain is an extraordinarily expensive luxury, metabolically speaking. In a very real sense, our brains want to do as little computation as possible, while still making good decisions.

- Computational limitations are a feature—an advantage—of our brains. Even though the brain has extraordinary computational power, with approximately 100 billion neurons and at least 1,000 times that number of connections between neurons, all that power isn't enough to perceive everything, to remember everything, and to weigh every cost and every benefit in an optimal fashion.

- Our brains aren't designed to process everything; doing so would be much, much too expensive. So, they simplify—when they can. They preferentially focus on some information, and throw away other information, to keep energy costs as low as possible.

- Simplification isn't always a good idea. If we take a complex problem and throw away the wrong information—for example, ignoring interest rates when deciding to refinance our home—

then we'll make very bad decisions. So, the main challenge lies in knowing what information we should process and what we should ignore. Our brains solve this challenge in an ingenious way: They take advantage of the structure in the world around us.

The World Is Structured

- Structure refers to the stable, predictable properties of the world around us. There are two main ways in which our world is structured, and that structure encourages us to simplify complex situations.

- First, the world is stable. This stability provides an important advantage: It helps us minimize the sort of processing we do. Every time you blink, which happens thousands of times each day, the world around you disappears and then reappears—but you don't notice it. That's because your brain assumes that the world is the same before and after the blink. It doesn't need to remember everything.

- Second, changes in the world are predictable. When we get new information, that information helps us predict what is likely to happen next. When we see lightning, we predict thunder. This prediction tends to be accurate because there are natural physical laws by which lightning causes thunder, and we have enough experience to have learned that causal relationship.

- This idea of structure will help when thinking about real-world decision making. Our processes of decision making, just like processes of perception or memory, assume that we make decisions in a structured world. That's what they evolved for—decisions in our natural world. However, many of our decisions don't have the same sort of structure. The stock market, for example, is neither stable nor predictable, and the very processes that help us make decisions in the natural world may hurt us when we make investments.

Bounded Rationality

- The concept of bounded rationality grew, in large part, out of the work of Herbert Simon, who was recognized with the Nobel Prize in Economics. He was trained as a political scientist, and he made major contributions to psychology, computer science, and many other fields. Throughout his career, Simon continually questioned the assumptions of rational choice models, and he sought not merely to reject those models, but to create something new in their place.

- In 1955, Simon set forth his ideas in a paper called "A Behavioral Model of Rational Choice." Simon used the word "behavioral" in much the same sense, well before behavioral economics became a field of its own. The two main features of Simon's bounded rationality are limited search and satisficing.

- If you decided to buy a car today, how many options would you have? 10? 100? 1,000? More? In the U.S. market alone, there are several dozen manufacturers, each with many models, and each of those models has a bewildering array of optional features for you to choose from. You can't possibly evaluate every possible car against every other car; you have neither the time nor the energy to do so.

When shopping for a new car, you could never weigh all of the models, colors, and features that exist against each other.

- How can you make a good decision? Let's think about the search process. When decision scientists or psychologists talk about the word "search," they mean "exploring the set of options." We need some process for narrowing those overwhelming options to a manageable set. So, instead of considering as much information as possible, we try to limit our search. We focus on a particular

category (sports cars), or a desired feature (fuel economy), or a preferred manufacturer. Doing so might limit our options down to only a handful of cars.

- Suppose that you've identified three models that seem like reasonable options. How do you pick one? A truly rational decision maker would approach the problem by listing every advantage and disadvantage and determining how those factors trade off against each other.

- Simon recognized that this approach was mathematically complex, time consuming, and likely to emphasize minor factors at the expense of what's really important. So, he proposed an alternative approach, which he called satisficing—a neologism that combines the words "satisfy" and "suffice." It's a complicated word that describes a common-sense idea: good enough.

- Suppose that you are trying to decide between three car models, and there are several features that are most important to you: performance, reliability, and fuel efficiency. For each feature that you are evaluating, Simon argued, you set up some aspiration level, and you judge each car model based on whether its feature is better or worse than your aspiration.

- So, for fuel efficiency, you might judge that more than 30 miles per gallon is "good enough." For performance, your aspiration level is more subjective; you want the car to feel both responsive and fun during your test drive.

- When you evaluate your three models, you find out that one satisfies your aspirations. It is "good enough" on every factor—fuel efficient, fun to drive, reliable—so you choose it, and you drive off the lot excited about your new purchase.

- This might have seemed like a perfectly reasonable way to purchase a car: Limit your search to a few models and then find something that is good enough on each feature that matters. In addition, it

is reasonable; it doesn't require any complex computations or take an inordinate amount of time. But it isn't optimal. You can make mistakes.

- A limited search process will, most of the time, lead you to a set of good options. But it can miss the best option. Your search might be unnecessarily constrained by your own biases or by your limited knowledge. If you are looking only at sports cars, then you might never consider a car classified as a high-performance sedan, even if that car would otherwise be perfect for you.

- Satisficing has a critical limitation: Using an aspiration level throws away potentially important information. Suppose that you evaluated cars based on only two factors: gas mileage and reliability. For gas mileage, your aspiration level was 30 miles per gallon, and for reliability, your aspiration level was one of the top 10 most reliable cars, as listed in a major consumer magazine. You look at two cars, A and B. Car A meets both criteria while B only meets the reliability criterion. So, A is better, right? Not necessarily.

- Suppose car A gets 31 miles per gallon and is the 10th most reliable. It's clearly a good enough option, given your criteria. But car B gets 28 miles per gallon and is the single most reliable car. The difference between 31 miles per gallon and 28 miles per gallon probably isn't a big deal, but the difference between the first and 10th most reliable cars probably does matter. So, setting an aspiration level tends to exaggerate differences right around that aspiration level, while ignoring differences above or below.

- Satisficing isn't perfect. But it isn't supposed to be perfect, or optimal, or mistake-free. Instead, it's supposed to help us simplify complex decisions to something manageable—by limiting our search and by satisficing—so that we make a decision that's good enough.

- Satisficing can particularly help us when the world is structured in our favor, and we're more likely to use satisficing or another

heuristic when we are overwhelmed, fatigued, or otherwise have impaired processing.

Core Tension

- Bounded rationality is an extraordinarily important idea. In some ways, it's at the very core of behavioral economics. We aren't omniscient, foresighted, and economically rational; we're just humans, simple and flawed, trying to make our way through a complex world. Bounded rationality argues that we won't make optimal decisions—but that we can make decisions that are good enough. So, embrace your limitations.

- Simplify as much as you can, but not too much. When you are making decisions about matters in the real world—about matters with which you are familiar, about matters that are stable and predictable—then simplifying can help you make much better decisions. It's often much better to try to identify the few most important factors in a decision rather than to spend energy and time identifying all factors that play into a decision.

- When the stakes are small or you are under time pressure or you just don't have much information, then a satisficing approach can help you make a decision that's good enough—and let you move on to more important decisions.

Suggested Reading

Gigerenzer, Todd, and T. A. R. Group, *Simple Heuristics That Make Us Smart*.

Simon, *Models of Man*.

Questions to Consider

1. How can using an aspiration level simplify our decisions? What problems could it introduce?

2. What are the parallels between the solution to the best-choice problem and human dating and marriage?

Heuristics and Biases

Lecture 12

Heuristics are often considered to be special cases of bounded rationality. Heuristics aren't weaknesses or failures in our decision making; they are tools that help us make good decisions most of the time. The key challenge lies in using the right tool in the right situation. This lecture will focus on four of the most important heuristics, each of which provides a tool for overcoming a particular sort of cognitive limitation: the familiarity heuristic, which involves memory; the anchoring heuristic, which involves valuation and reference points; the representativeness heuristic, which involves the estimation of probabilities; and the affect heuristic, which involves simulation of feelings and emotions.

The Familiarity Heuristic

- The familiarity heuristic means that we recognize something. The familiarity heuristic makes brand-name consumer products more desirable and violent crimes seem more common than they really are. Familiarity comes from the ease with which something is available to be brought to mind, and thus, it is sometimes called the availability heuristic.

- The decision scientist Gerd Gigerenzer has shown that being too familiar with what's being judged can actually undermine the benefits of familiarity. When making judgments like which city is larger or which author has sold more books, Gigerenzer and colleagues showed that the most accurate judgments would be made by someone who's only familiar with about 75 percent of the items being judged; that person would typically do better than someone who has at least heard of every item before.

- Familiarity provides such a powerful tool because of the structure in the world around us. If you ask casual sports fans to predict the winners of Wimbledon tennis matches, they often simply pick the player with whom they are familiar. These simple judgments of

familiarity have been shown to be good predictors of who will win a match and even do slightly better than the actual player rankings.

- The familiarity heuristic is also connected to our judgments of probability. People tend to overestimate small probabilities but underestimate large probabilities. This can lead to a strange phenomenon called subadditivity, in which the total probability (which must be 100 percent) ends up less than the sum of the individual probabilities.

- The familiarity heuristic affects our economic decisions, too. People overvalue and are more likely to invest in the stocks of familiar companies. This can lead to very bad outcomes. In the extreme, investing one's retirement savings in one's own company stock carries a massive risk: For example, a catastrophic event that bankrupted the company could also eliminate all retirement savings.

- But there is other evidence from behavioral finance that investors whose portfolios have a bias toward familiar companies, such as those from one's own geographic area, obtain slightly higher returns than investors who show no familiarity bias. Familiarity involves the use of information, and that information might help some investors.

The Anchoring Heuristic

- The second heuristic is anchoring. This heuristic uses some initial estimate as an anchor to bias our subsequent judgments. We use anchoring when we are uncertain: We don't have all the information needed to make an accurate judgment, so we latch onto anything given to us.

- Does our galaxy contain more or fewer than 100,000 stars? How many stars are in the Milky Way Galaxy? This second question is not something for which you have personal experience. Even if you've seen the Milky Way, you've only seen a small fraction of its stars. And, unless you are an astronomy buff, you probably haven't encountered the answer recently, so you can't give an

estimate based on explicit knowledge. Without personal experience or explicit knowledge, you need to find something on which you can base your estimate.

- The first question provided a number—100,000—which is an anchor. It seems like a big number, and if you're being asked about it, then you might infer that it's close to the right answer. So, when faced with a difficult judgment like determining how many stars are in the Milky Way, people often begin with any number given to them and then adjust their estimate upward or downward from that anchor. The anchor, like its nautical namesake, constrains how far a subsequent estimate can move.

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The Milky Way Galaxy consists of several hundred billion stars, one of which is Earth's Sun.

- No one knows exactly, but the current best estimates are that there are several hundred *billion* stars in the Milky Way Galaxy. In this case, the anchor given was about one million times too low—so it typically leads to estimates that are likewise far too low. If you had been given a much larger anchor—Does our galaxy contain more or fewer than a *trillion* stars?—then the estimates would have been much, much higher.

- Marketers use anchoring when pricing goods that are rare, infrequently purchased, or difficult to value. Consider expensive furniture or jewelry at a specialty store. Often, these items will be displayed with a very high suggested retail price. That price might have no connection to reality; it doesn't represent the cost of manufacturing, consumer demand, or anything else meaningful. It's just an anchor. The store wants you to start with that suggested retail

price and then negotiate downward. They know that providing a very high anchor increases customers' estimates of value and leads to higher eventual selling prices.

- It is important to emphasize that anchoring works even if there is no meaningful connection between the anchor and the subsequent estimates. In some laboratory experiments, researchers have generated anchors by asking people to spin a roulette wheel or to write down the last two digits of their social security number. Even when the anchor is generated in a completely random fashion, it still can influence behavior. Furthermore, anchoring influences real-world economic transactions, even those with extraordinarily large stakes.

The Representativeness Heuristic

- The third heuristic is the representativeness heuristic, which helps us estimate probabilities through the following simple rule: Prototypic events are likely events.

- The following illustrates this heuristic; it is a description of a person named Rebecca. Think about what sort of job she might have.
  - Rebecca is intelligent, extroverted, and gregarious. From an early age, she always liked looking at the night sky and speculating about life on other planets. In school, she was always strong in math and science courses, although she was a good writer as well. As an adult, she loves going *fast*—running, riding horses, and even driving fast cars are all passions. She is willing to take risks, especially if they allow her to pursue her dreams. And, she's a good communicator, especially for things she feels passionate about.

- How likely is it that Rebecca is a teacher? An astronaut? A lawyer? A science writer?

- This example has been adapted from the work of Daniel Kahneman and Amos Tversky, two pioneering figures in behavioral economics. When people are given scenarios like this, they commonly report that Rebecca is most probably an astronaut—she seems like a prototypic

astronaut. She's interested in science and math and has a love for the night sky and life on other planets. She's willing to take risks and is passionate about her work. Next most probable would be science writer; she loves science and is a good writer and communicator, after all. And least probable would be lawyer and teacher.

- Now, have you ever met an astronaut? Do you have an astronaut living on your street? At any one time, the United States has about 100 people whose current job description is "astronaut"—that's it. By comparison, there are several million teachers, more than a million lawyers, and thousands of science writers.

- Even if Rebecca seems most representative of an astronaut, there are so few astronauts that it is much more likely that she's a teacher or lawyer. There are surely many more science-oriented and risk-loving teachers and lawyers than there are astronauts.

- The representativeness heuristic fails here because these professions differ dramatically in their base rates. Teachers and lawyers are much, much more common than science writers and especially astronauts.

- So, why do we rely on representativeness when it leads to such obvious mistakes? This heuristic exists because it is a fast and simple guide to probability. Students with good grades are more likely to do well in medical school. The leading brand of toothpaste is a good product. Prototypes are often prototypes for a reason; they're often the best or most common member of some category.

- Representativeness fails when prototypes are rare—like astronauts—but succeeds when prototypes are common. That rule provides clear guidance: Be wary when representativeness points you toward some rare conclusion.

The Affect Heuristic

- The final heuristic is that of the affect heuristic. To a psychologist, "affect" means the internal sense of emotion—what we feel, our

mood. The affect heuristic involves choosing one option over another based on their anticipated effects on our emotional state.

- Emotions don't always get in the way of our decisions; they can be extraordinarily useful. When we use the affect heuristic, we are simulating our future self—and what our future self might feel after we've made our decision. To the degree that our simulations are accurate, we can check out the consequences of our decisions before we even make them.

- Simulation is one of the most powerful tools we have for making good decisions. The neuroscientist Antonio Damasio recognized this in his somatic marker hypothesis. He argued that our brains store representations of our feelings and the associated body states, which he called somatic markers.

- For example, when we walk down an unfamiliar dark alley at night, our brains store the feeling of dread, the racing heartbeat, and the sense of alertness that accompany our risky action. The next time we approach a dark alley at night, our brains can bring to mind the stored somatic marker. We can simulate that feeling—of taking that risk—before we ever step foot down the alley, and then we can choose another path home.

- Simulation is a fast process. We don't have to consciously think about it; we just do it automatically. The affect heuristic often leads to good choices, in that we can anticipate and avoid decisions that would make us unhappy, regretful, or angry. However, it fails when negative consequences of our decisions are particularly easy to bring to mind or when we overestimate short-term mood at the expense of long-term satisfaction.

Suggested Reading

Beggs and Graddy, "Anchoring Effects."

Tversky and Kahneman, "Judgment under Uncertainty."

Questions to Consider

1. Why do people use heuristics, given the mistakes that can be made?

2. How can we use our emotions to improve our decisions?

Randomness and Patterns

Lecture 13

People believe that they see patterns in all sorts of places, from the stock market to horoscopes. It's very easy to dismiss those beliefs as superstitions or foolishness and then to ignore the lessons they teach us. This lecture will show you what we can learn from studying them instead. We're naturally good at seeing patterns, even when they aren't really there, but if we seek the right evidence, we can learn what patterns are real and what aren't—and make better decisions as a result.

What Is Randomness?

- Randomness means that you can't predict the future from the past. A simple way to generate a random sequence is to flip a standard coin 20 times. You can diligently record the outcomes of the first 19 flips, looking for patterns in that sequence, but no amount of analysis will ever help you predict what will happen on the 20th flip. There will always be equal chances of a head and a tail. The process of flipping a coin leads to a sequence of events that is unpredictable.

- Suppose that you instead asked a friend to generate a sequence of 20 hypothetical coin flips—by writing them down without using a real coin. If you could study the first 19 flips in your friend's sequence, you could indeed improve your probability of guessing the 20th. This is a nonrandom process.

- It turns out that people show a particular bias when trying to behave randomly. They switch too much. They try to make short sequences of events seem random, and they introduce too many patterns that alternate between events. Look at the 19th flip. If your friend wrote tails, guess heads—or vice versa. Because your friend is human, and carries the same biases as the rest of us, looking at his or her past behavior can improve your predictions. Nonrandom processes are predictable, at least in principle.

- The idea of randomness is closely tied to the idea of information. A process that is completely random carries no information about the future, and it doesn't tell us anything that helps us make better decisions. However, a nonrandom process contains information; if we know what to look for, we can learn from that information and make better decisions in the future.

- Think about sequences of events in the natural environment. When we see lightning, we can predict that we'll soon hear thunder. When we drop a stone at the top of a hill, we can predict that it will roll downward. Events in the natural world are predictable because they were generated by nonrandom processes; the laws of physics bind different events together into meaningful sequences.

- Just because something is nonrandom, it doesn't mean that we know everything or can predict the future perfectly. Sometimes we see lightning, and then the thunder doesn't come. However, with careful observation of a nonrandom process, our predictions about the world around us get better over time.

- In every case that you can imagine, learning about patterns in nature—and in other people—made our ancestors more likely to survive and prosper. It's no wonder, then, that we've evolved to be really, really good at finding patterns. Our brains look for patterns automatically, without any conscious effort, and even if there's no pattern to be found.

- Patterns don't have to be in time. When we look at a mesa on Mars and see a face, that's because our brains are interpreting the collection of cliffs and plateaus as a face-like pattern. We're particularly good at seeing faces in almost anything.

- Your brain is constantly looking for structure out there in the world. It's looking for something that's predictable, that's meaningful, that it can use to guide behavior. When we see a predictable pattern and anticipate what will happen next, we can use simple rules like

heuristics to help us not only avoid unnecessary processing but also make better decisions.

ESP

- We've all experienced things that seem unexplainable; we're thinking about a friend with whom we haven't spoken in months, and then that friend calls us that very day. To present-day scientists, such experiences are just random coincidences. But in the first half of the 20th century, incidents like this were seen by some people as legitimate, scientific evidence of extrasensory perception (ESP).

- Probably the most famous proponent of ESP research was J. B. Rhine, a botanist who became fascinated with these phenomena. Rhine coined the term "ESP" because of his belief that people can perceive things without relying on the usual senses like sight or hearing.

- Over nearly a century of research, there's never been a single example of a person who can walk into a room, sit down at a table, and always guess cards at a rate greater than chance. Nor has anyone identified a plausible biological mechanism by which ESP could arise. A short-term pattern might just be chance, not evidence.

- As time has passed since Rhine's early studies, the evidence for ESP hasn't gotten any stronger. That's one of the hallmarks of a random process: We can't learn from it over time.

Gambling

- Modern casinos know that people see patterns in random events, and they take full advantage. Consider the game of roulette. A small ball is spun around a numbered rotating wheel, and players bet on which number the ball will stop. From spin to spin, the outcome will be completely random. The wheel rotates so fast that even tiny changes in how the ball is spun have unpredictable effects.

- However, if you walk by a modern roulette table, you'll often see an electronic scoreboard that shows the outcomes of the last few

spins. Players will check those scoreboards to look for patterns, and they will stay at the table and change their bets accordingly.

- It doesn't matter what they bet; the house advantage is the same regardless. So, why does the casino provide those scoreboards? To keep players at the table. The casino just wants them to see patterns and keep betting.

- With most types of gambling, you can't predict the future from the past. We see patterns in what's already happened—not what will happen. If the past doesn't predict the future, then looking for patterns can't help us.

Hot-Hand Effects

- Suppose that you are attending a basketball game. On one of the teams is LeBron James, one of the most talented athletes in professional sports. LeBron dribbles down the court and makes a jump shot, and a few minutes later, he makes his next shot. Then, a minute later, he makes a third shot in a row. What is the probability that his fourth shot will go in?

The hot-hand effect describes the notion that a basketball player seems to be on a "hot" streak.

- LeBron is an outstanding player who makes about half of his shots. Given that he's made three shots in a row, does he now have a greater than 50-percent chance to make the fourth shot? Many people would say that LeBron has a "hot hand" and predict that his chances of making the next shot are considerably greater than normal.

- However, this nonrandom "hot-hand effect" does not stand up to scientific scrutiny. Research has shown that the probability of

making a shot does not change, regardless of whether the previous shot was made or missed. In other words, the sequences of made and missed shots are essentially random.

- We think that there is a hot-hand effect because we can remember examples of players making four or five or more shots in a row; when one of our favorite players does that, we might leap out of our seat with excitement. Those are vivid memories. However, remember the representativeness heuristic from the previous lecture: We overestimate the probability of events that can be easily brought to mind.

Generating Random Series

- When an individual or corporation is suspected of financial fraud, a forensic accountant evaluates their financial records. In many cases, those financial records have been doctored; the perpetrator tries to destroy evidence by replacing the illicit transactions with random numbers representing seemingly innocuous transactions. How could one determine whether a set of transactions might be fraudulent?

- One surprising tool comes from the nature of randomness itself. In the 1930s, the physicist Frank Benford collected measurements of a wide range of phenomena: the populations of cities, the size of rivers, and even statistics of baseball players. For every measurement, he wrote down the first digit. For example, if the city had a population of 1,000, 10,000, or 1,000,000, he wrote down "1." He repeated this for thousands and thousands of data points and then plotted how often each numeral—from 1 to 9—came up as the first digit.

- We might expect that each numeral would be the first digit equally often, or about 11 percent of the time. Instead, Benford found that the numeral 1 was the most frequent (about 31 percent of the time), and each succeeding numeral was less and less frequent, with 9 only appearing as the first digit about 5 percent of the time. This relationship has become known as Benford's law.

- Benford's law has become a powerful tool for forensic accountants. When people create sets of random numbers, as when an embezzler seeks to cover his tracks, they try to use every numeral equally. But that attempt at randomness doesn't match the sort of randomness in real account balances, and thus, it can be detected.

- Benford's law illustrates the importance of thinking about the process that generates structure. If events come from some well-defined process, like the growth of money due to compounding interest, then knowledge about that process can help us make decisions. However, if we don't know or can't know the generative process, then patterns are unlikely to be helpful.

Recommendations

- First, know when patterns are likely to be meaningful—and when they aren't. We often think that we can predict the future based on the patterns of the past. We are inveterate predictors, but we keep trying to predict even when we shouldn't. We often get it exactly backward: The things that we think are random aren't, but the things that we think aren't random are.

- Second, don't think about a pattern without thinking about what *didn't* happen.

- Third, look for evidence that gets stronger as time passes. If a pattern is just due to randomness, then as time passes, it won't recur—the evidence won't get any stronger. However, if there's something real, then the pattern will become clearer and clearer.

Suggested Reading

Gilovich, *How We Know What Isn't So*.

Gilovich, Vallone, and Tversky, "The Hot Hand in Basketball."

Taleb, *Fooled by Randomness*.

Questions to Consider

1. Why does our brain constantly look for patterns in the environment?

2. What distinguishes patterns that are likely to be meaningful from those that are meaningless and random?

How Much Evidence Do We Need?

Lecture 14

In this lecture, you will learn about the nature of evidence. How should we incorporate evidence into our decisions and judgments, and in what ways do we make mistakes? We want to find evidence that supports our beliefs, that helps us make dramatic discoveries or win arguments. We're very good at seeking out that supporting evidence, and we're very good at developing counterarguments against evidence in which we don't believe. But we need to be skeptical—not just about others, but about ourselves. Sometimes, we just shouldn't believe our own eyes.

What Is Evidence?

- Information can be meaningful or meaningless. Meaningless information doesn't help us predict what will come next. When we make decisions, we only care about meaningful information—information that helps us make better decisions, that helps us decide on one course of action or another. We care about meaningful information, called evidence.

- It's ideal if we have a great deal of high-quality evidence supporting our decision. But that's not always the case. Sometimes we have only a little evidence, but it's of high quality; other times, we have a lot of evidence, but it's of low quality. Both of these are valuable for decisions. You want high-quality information, when you can get it, and you want lots of information, when you can get it, but you don't always have lots of high-quality information.

- When people have to decide between two options—one with a little high-quality evidence and the other with a lot of low-quality evidence—they often make systematic mistakes. In particular, people tend to overestimate the quality of evidence. And they underestimate the value of having lots of evidence, even if it's low quality.

Evidence Quality

- People overestimate the likelihood of events that seem typical, familiar, or memorable. In large part, this overestimation happens because we are so good at inductive reasoning—drawing evidence from one example and applying that evidence for some more general judgment or decision. We see patterns and generalize from those patterns, as shown in the previous lecture on randomness.

- We're so good at drawing evidence from events, in fact, that we'll use that evidence even when it shouldn't apply. We're easily influenced by anecdotes and stories, even if those anecdotes shouldn't be relevant to our decision. Anecdotes and extreme events don't necessarily provide good evidence. Events can seem extreme *because* they are atypical and unrepresentative, in which case they shouldn't shape our decisions.

- When thinking about whether to accept a new job, don't just think about the ideal circumstances. Force yourself to think about what's typical, along with what could be extremely good or extremely bad. Considering a broader range of evidence can help you make better decisions.

Confirmation Bias

- Another reason that people overestimate the quality of their evidence toward a decision is that people tend to seek out evidence that confirms their existing beliefs, instead of evidence that could refute those beliefs. That's called confirmation bias.

- We see echoes of confirmation bias in the popular media, in our conversations, and in ourselves. When people take a strongly held position—like on a political hot-button issue—they interpret new evidence in whatever way best fits their existing beliefs. So, new evidence tends to reinforce people's strongly held beliefs, even when that same evidence might be seen by a neutral party as challenging those same beliefs.

- Several factors contribute to the confirmation bias. One possibility is that people preferentially seek out streams of information that tend to support their prior beliefs. There's good evidence that this matters; for example, people prefer news programs that tend to share their political slant, not challenge it, and they avoid other potential sources of conflicting information.

- Another possibility is that when people see evidence against a strongly held position, they simply ignore it. That's usually not true, though. When shown two arguments—one confirming their beliefs, the other disconfirming—people tend to spend relatively little time reading and thinking about the confirming evidence. Instead, they spend their time looking at disconfirming evidence, not ignoring it.

- So, that leads to a third possibility: People actively reinterpret evidence that would otherwise argue against their belief. When they read an argument against their position, they don't just accept that argument. Instead, they start thinking about counterarguments.

People tend to seek out evidence that confirms their existing beliefs, instead of evidence that could refute those beliefs.

They internally generate new evidence in support of their prior belief, which in turn actually strengthens their original position.

- This gives us two main reasons for the confirmation bias: We prefer sources of evidence that tend to confirm our existing beliefs, and we counterargue disconfirming evidence, strengthening our original beliefs in the process.

- It's very difficult to eliminate the confirmation bias. None of us wants to be constantly challenged in our beliefs, and we all want to feel that our beliefs are rational and justified. All one can hope to do is minimize it as much as possible.

- There's one approach that helps—and it's not very difficult, if you are willing to try it. You just have to switch sides. You should force yourself to take the other position and present its case without counterargument.

- Do your best to identify the most reasonable and strongest arguments for that other position. The key is to avoid counterarguing for your existing beliefs. Instead, put yourself in the shoes of another person, a reasonable member who happens to take the other side. That'll disengage you from the desire to be consistent—from your own passions—and force you to think about the evidence from another perspective.

- Ideally, you want to think about alternatives to your prior beliefs as early as possible so that you aren't too biased in the evidence you acquire. However, it's still good practice for all of us to challenge our beliefs, even strongly held ones.

Sample Size

- People tend to underestimate the value of having lots of evidence, even if that evidence is of low quality. In many cases, the amount of evidence is given by the statistical term "sample size," which describes how many data points have been measured.

- People often have a hard time interpreting information about sample size. It's not that they think sample size isn't important—we all know that more evidence is better than less evidence. Instead, the challenge for decision making comes when quality of evidence and sample size come into conflict.

- Suppose that your friend shows you two coins. You are told, truthfully, that one of the coins is weighted on one side so that it will flip that same side about two-thirds of the time. The other coin is just a normal, fair coin. You need to guess which is which.

- Your friend pulls one coin, chosen randomly, out of his or her pocket and flips it three times. It comes up heads each time. Your friend then pulls the other coin out of his or her pocket and flips it over and over. After a few minutes, the tally is 20 heads and 15 tails.

- When surveyed, most people guess that the first coin is the biased one; it always comes up heads. But even a fair coin will flip the same way three times in a row pretty often—about 25 percent of the time. The second coin has a much larger sample size, and it actually is slightly more likely to be the biased coin.

- For many sorts of decisions, there's a sort of diminishing returns for sample size. A good example comes from polling in nationwide elections. If you want to find out what candidate a majority of Americans prefers for president, for example, you don't need to survey millions of people. A survey of a few hundred to about a thousand people will provide a reasonably small margin for error—on the order of about four percent. Increasing the sample size beyond that point wouldn't make the poll much better.

- What matters most for polling is that the sample is representative. There shouldn't be any systematic bias in who participated. A large poll doesn't do any good if the people's opinions aren't independent from each other, as can happen if a poll samples too many people from one geographic area or from the same age range. It's usually

better to have a sample of 500 people who are broadly representative of the population than a poll of 10,000 unrepresentative people.

- We often do better with more, low-quality evidence, but once sample size becomes large enough, then there are cases like polling for which quality becomes more important.

Evidence Accumulation

- We only have a few tantalizing hints about the process of evidence integration and why it sometimes goes awry, at least for complex real-world decisions. Those hints come from research on much simpler sorts of decisions—those only involving two known outcomes, with no uncertainty. The basic idea is that evidence is accumulated over time, and a decision is reached when the evidence reaches some criterion.

- The current best models assume that evidence accumulates continuously until we reach a decision. If the evidence seems to be very high quality, then the rate of accumulation is faster, and we decide more quickly, although we are also more prone to mistakes. If there's a lot of low-quality evidence, then the rate of accumulation is slower, and our decisions are slower but potentially more accurate.

- There's much more to be learned about this process. We don't yet know whether the very basic mechanisms that help explain fast, two-item choices are also used for much slower and more complex choices. And, it's not yet possible to explain all of the biases presented in this lecture.

- However, this very simple sort of model holds promise. It's consistent with how our neurons work, it's consistent with basic psychological experiments, and it's consistent with simple economic choices. So, there are good reason to believe that more complex decisions work in much the same way.

Suggested Reading

Morewedge, Gilbert, and Wilson, "The Least Likely of Times."

Sheehan, "Venus Spokes."

Questions to Consider

1. What trade-offs do we make when we wait for more evidence before making our decisions?

2. What is the confirmation bias, and how does it affect our decisions?

The Value of Experience

Lecture 15

This lecture will consider how we should make decisions about our own experiences. When we're deciding how to spend our money, how can we compare intangible experiences like vacations and concerts to physical goods like electronics and cars? What price should we put on our memories? In this lecture, you will learn about value of our experiences. This lecture will argue something that may seem irrational: Experiences are undervalued. They aren't as fleeting as they seem, and we're often better off spending money on experiences than we are on material goods.

What Is an Experience?

- Material goods are computers, furniture, clothes, cars, books, and houses. They are things that exist in our physical world. We can trade them to others. We can save them for later—in some cases indefinitely.

- Experiences are a little more difficult to define than material goods. For this lecture, experiences are the perceptions, emotions, and memories evoked by some event. Experiences are internal to each of us, and thus, we can't trade them to others; we can't save them for later.

- We are acting under the assumption that material goods and experiences are two distinct categories, but they aren't completely distinct. Think about material goods and experiences as two extremes on a continuum. And if it's helpful to think of one feature that distinguishes them, then think about time. Material goods last; experiences are fleeting.

Undervaluing Experiences

- In the early 2000s, psychologist Tom Gilovich and his colleagues began to explore what generated the most happiness: experiences or material goods. In their first laboratory study, they instructed half of

their participants to describe the most recent material purchase that had cost them at least 100 dollars. The remaining participants were instructed to describe their most recent experiential purchase of at least 100 dollars.

- Then, the participants answered a series of questions about that specific purchase, including how happy it made them feel and whether the money seemed well spent. The results were simple and striking: Experiential purchases led to more happiness, both when thinking back to the purchase and more generally in one's life. Experiential purchases were more likely to be seen as money well spent. In addition, experiential purchases generated less regret.

- A follow-up study was conducted in a large, nationwide, random sample. Each person was asked to think about two recent purchases—one material and the other experiential—that had been purchased in order to increase his or her personal happiness. Then, each person was asked which of those two actually makes him or her happier. Experiential purchases made people happier, and that advantage held for every demographic group tested.

- There was only one factor that made the advantage of experiential purchases go away: income. People with incomes less than about 25,000 dollars reported that material goods and experiences evoke the same relative happiness. But as income increased above that level, there was a greater and greater bias toward experiential purchases. Of people with incomes about 150,000 dollars per year, the highest category used, about 70 percent reported that their recent experiential purchase made them happier.

- Experiences make people happier than material goods. This result has been replicated in multiple studies by many other psychologists and marketing scientists. Furthermore, when researchers ask people to evaluate others' purchases of experiences and goods, the effects become even stronger.

Memory

- For experiential purchases, people don't show the normal biases of comparison. They don't do as much comparison before they purchase, they don't need to justify their purchase afterward, they aren't bothered if they could have gotten a better deal, and they aren't jealous if someone else gets a better deal.

- As a general rule, experiences don't lend themselves to comparison in the same way as material goods. That's partially due to the fact that experiences are subjective and internal; it's harder to compare vacations or concerts or cooking classes than it is to compare electronics or cars. But there's an even deeper reason—one that explains why experiences have such a lasting effect on our happiness: Experiences are fleeting, but memories last.

- The first and most important fact about memories is that they aren't accurate—at least, they aren't anything like a literal recording of an experience. Scientists who study memory now think that memories about our past consist of a set of sensations and emotions that are linked together when necessary, such as when a memory is formed and when that memory is brought to mind.

- Your memory of going to Disney World as a young child might include the visual image of staring up at Cinderella's castle, the tactile sensation of holding your father's hand, the noise of the street performers behind you, and the intertwined emotions of awe and excitement.

- Those different sensations and emotions are actually stored independently in your brain. Visual features of a memory are stored in brain regions that support vision, tactile features are stored in brain regions that support touch, and so on. But when a memory is retrieved, your brain has to access all of those different components of a memory and to bind them together again into one coherent experience.

When retrieving memories from past experiences—for example, when looking through old pictures—we feel like the same way that we feel when we are being rewarded with something tangible.

- The act of successfully retrieving a memory turns out to be extraordinarily rewarding. We like it when we're prompted to remember an event from our past. Think of how hypnotizing it can be to watch old photos rotate through a slideshow on a computer or television. When we retrieve memories of our past, our brain's reward system becomes active—in much the same way as when we win money or sip a glass of wine.

- Memories aren't literal recordings of our experiences. They change over time; they tend to become more positive. Think back to some vacation or other trip in which you went camping, hiking, canoeing, or something else outdoors. Most outdoor vacations combine both good and bad elements: Roasting marshmallows is followed by freezing in a cold tent.

- However, our memories of those vacations do something amazing over time. They change. The bad parts of the memories—the

frustration, delays, cold—are likely to fade away. Or, they become more positive, as we reinterpret an unpleasant experience into something that gives us a good story. And the positive parts of the trips remain and get stronger as we remember them.

- In some ways, our memories become better over time. It's not that they become more accurate, but they become more positive. They become better stories; they become more valuable.

- This idea—that memories have substantial and increasing value—helps explain why experiential purchases generate such long-term happiness. Experiences generate memories. We enjoy retrieving those memories and reexperiencing the events from our past. And those memories actually become more and more valued over time.

- But there's an important caveat to raise. Bad experiences are no better than bad material goods, and a very bad experience can last longer in memory than a bad material purchase. Many bad material purchases are simply worthless; their negative features end when they are discarded. So, it's worth thinking about memory as something that extends our experiences in time: Good experiences become better as they last, but bad experiences disappear or change, albeit slowly.

Memory as Identity

- Do memories explain our satisfaction with spending money on experiences? In one study by the psychologists Tom Gilovich and Travis Carter, research participants were first asked to remember a significant experiential or material purchase they had made and to describe their satisfaction with that purchase. After the participant described that purchase—maybe a beach trip or perhaps a new car—he or she was given the following instructions.
    - Imagine that you could go back in time for just an instant and make a different decision, choosing one of the alternatives instead, and then come back to the present. All of your current memories of that purchase would be replaced with new memories that were formed as a result of the different choice,

but ultimately you have arrived back at the same place and time, right where you are now.

- Would you go back in time and switch all of your memories of your beach trip with new memories—for example, of a trip you *didn't* take to the mountains? The participants were asked to rate how willing they would be to trade in their memories of their experience or of their material good.

- The participants were more satisfied with experiential purchases than material purchases. However, that effect was driven by memory. The most satisfying purchases were those that generated memories that people wouldn't give up. Most experiences are better than most material goods at generating memories, so people tended to find experiential purchases more satisfying.

- Although it might seem a little counterintuitive, experiences generate more happiness and less regret than material goods, but it's not because of the pleasure of the experience at that time—it's because of the later memories the experience creates. And, over time, our memories help define our identity.

- Most people prefer to know about other people's experiences than about their material goods; they see people's experiences as more revealing of their true selves. We judge people by the experiences that they seek out. This preference is weaker in people who are more materialistic, but it doesn't go away. Our experiences become part of us; they define who we are. And we can use knowledge of others' experiences to judge them.

Being Satisfied with Your Decisions

- Prioritizing experiences over material goods is often a very good idea. In general, once basic needs are met, purchases of experiences lead to more immediate happiness, more satisfaction with those purchases, and better memories. There's a really obvious recommendation here: Spend more money on experiences. However, that's not always possible. You can't spend all of your

money on experiences, and you shouldn't try to. Material goods can certainly generate happiness, under the right circumstances.

- There are a few tools that can help you become more satisfied with your decisions—of all sorts. The first is to think about your purchases, whether experiential or material, in terms of the experiences they provide. That's easy for a vacation or concert; it's harder for material goods like cars or computers. But it's still possible.

- The second recommendation is to think in terms of time, not money. Thinking about time forces us to consider our experiences—how we'll feel, what we'll get to do. We start prioritizing different things—with whom we'll connect, how we'll feel, what we'll remember.

Important Terms

Carter and Gilovich, "The Relative Relativity of Material and Experiential Purchases."

Mogilner and Aaker, "The Time vs. Money Effect."

Questions to Consider

1. Under what circumstances can experiences be better purchases than physical goods?

2. What makes experiences so valuable?

Medical Decision Making

Lecture 16

In this lecture, you will learn about three factors that influence how we make medical decisions: how we deal with uncertainty, how we evaluate good and bad outcomes, and how we're guided by others' opinions. In one sense, there's nothing special about medical decisions: All of these factors influence nonmedical decisions, and we don't have any sort of brain module specific for medical decisions. However, in another sense, medical decisions are special. They involve our bodies, our capacities, our sense of self—even life and death. Medical decision making has the same biases as other forms of decision making, but there are also some key differences.

Uncertainty

- The first factor that shapes medical decisions is how we deal with medical uncertainty. Researchers have examined how real patients use probabilities when evaluating treatment options. When patients are told that a medicine has a 40-percent chance of controlling your disease, some people know what this means: The medicine works for 40 people out of every 100. But many people don't know what this means. They think of that 40 percent more abstractly, as if the physician was relating the chance of rain—it could reflect the physician's confidence or how much the symptoms would be reduced.

- Sometimes physicians describe probabilities in verbal labels: A side effect is "common" or "rare," and the success of the surgery is "likely" or complications are "unlikely." These labels are simpler for people to understand than probabilities, but different people treat the same label very differently, and what you think a probability label means could have dramatic effects on the treatment you choose.

- People also care not just about their own risk, but also about relative risk—how their probability compares to other people's probability.

If a diabetes medication reduces the probability of cardiovascular disease from 40 percent to 30 percent, it's not clear how good that is. What's the reference point?

- For medical decisions, people often care about whether their chances are higher or lower than their peers. This can cause problems. If we see ourselves as doing better than our peers, then we're less likely to take preventative actions. Other people's risk shouldn't affect our decisions, but it does.

- Even more challenging to process is information about changes in risk, such as the following statement: "Taking a statin medication reduces your long-term risk of cardiovascular disease by 50 percent." Emphasizing changes in probability can be very misleading. Statements like "Your chance of heart disease doubles if you don't take the medication" typically cause people to overestimate risks.

- What seems to work best is giving people absolute probabilities and presenting those probabilities in terms of frequency: Without taking this medication, four out of 10 people with diabetes like yours will develop heart disease, but with the medication, it drops to only three in 10. That is, about one in 10 people can prevent heart disease just by taking this medication.

- Using absolute probabilities makes the consequences of different decisions much more concrete. But it's not perfect. The common bias in how people use probabilities is they overestimate the probability of rare events, underestimate very common events, and are largely indifferent for events of intermediate probability.

- These biases not only hold when people make decisions about medical outcomes, but they're even exaggerated. The difference between certainty and a little bit of uncertainty looms very large. We want cures, not changes in probability.

- Many medical outcomes are rather rare. Read the safety sheet for any drug and you'll find a very long list of potential side effects, most of which are of very low probability. These rare outcomes can be vividly brought to mind, and we want to avoid them entirely, not have a small chance looming over us.

Reward/Cost

- The second factor that shapes medical decisions is the vividness of good and bad outcomes. As a general rule, outcomes that are more vivid, more tangible, and have better defined consequences exert greater influence on our decisions.

- People recognize that mental health can be more burdensome than physical health, but chronic depression is less tangible than chronic diabetes, for example, so research has shown that people are willing to pay more money to avoid diabetes than depression.

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Depression is a serious mental illness, but it isn't viewed as being as serious as a physical illness.

- Historically, there's been much more money spent on research and treatment of physical illness than mental illness, even though people understand just how debilitating mental disorders can be. Similar discrepancies can be seen when you ask people how much of their life span they'd be willing to give up to avoid different diseases; their answers don't necessarily match their sense of disease burden.

- Vividness influences our medical decisions in other ways, too. People sometimes avoid taking action because they fear the regret associated with making a choice that leads to harm. This is sometimes called the omission bias—harms of omission

aren't our fault. This bias works against us when we face rare or unknown risks.

- Many children have become sick or died because they didn't receive a freely available vaccine. When parents are surveyed, the primary factors that predict that their children won't be vaccinated are the perceptions that vaccines are dangerous and ineffective—and the omission bias. Parents who don't vaccinate their children are more fearful of taking an action that they perceive could harm their child, as compared to parents who vaccinate.

- Our decision biases matter. Many public health problems arise because of behaviors whose potential negative consequences are long term and uncertain. Just because you have dessert every evening doesn't guarantee that you're doomed to cardiovascular disease, diabetes, and an early death.

- Behavioral economist George Loewenstein points out that, in many medical decisions, the option that's best for us and best for society involves tangible costs but intangible benefits. It's no wonder that people aren't willing to pay a cost—for example, by exercising regularly or giving up fatty foods—in order to receive some uncertain, distant benefit.

Others' Opinions

- The third and final factor that shapes our medical decisions is others' opinions. We often consider what other people think when making our own medical decisions, for at least two reasons.

- One reason is that our medical decisions have consequences for others. We think about how our own medical choices will affect our partners, parents, children, and friends.

- A second reason is how we use others' opinions to make medical decisions. The health-care system in the United States—and in many other countries—relies on interactions between patients, their physicians, and other health-care workers.

- When recommending something to another person, especially someone unconnected to us, we try to think about his or her needs. We distance ourselves from the decision; it doesn't generate strong emotions.

- Often, our decisions focus on specific trade-offs that can be readily justified to others. For example, you can justify a complicated surgery by thinking that there might be a few potential complications, but they are very rare, and they're still much better than death.

- The idea that advisors seek to make decisions that can be justified to others connects back to the concept of regret aversion. Physicians want to avoid regret, too—and that can change what they recommend. Keep in mind that physicians exhibit the same biases as the rest of us.

- Medical decisions often rely on advice from others, particularly physicians and other health-care workers. Getting recommendations from others can often improve our decisions, because those recommendations aren't as influenced by emotional reactions to rare events and other biasing factors. However, we should be aware that advisors aren't bias-free. Like us, they want to avoid regret, and that can push them toward safe, default choices that can be easily defended, rather than a risky choice that might be best for us.

Making Better Medical Decisions

- Even more than financial decisions, medical decisions are intensely personal, and there's no simple rule that can guarantee good outcomes or even good decisions. Everyone's medical situation is unique. The following recommendations, accordingly, are intended to help apply general principles of behavioral economics so that the process of decision making improves.

- The primary recommendation is that you should make decisions about yourself, but with others. Decisions will be better, overall, if

you consider your potential benefits, costs, and risks independently from others' outcomes. Think in absolute terms, not relative terms; don't compare yourself to others.

- This is particularly important for decisions about prevention. You should evaluate your own risk. You might only have a 40-percent chance of cardiovascular disease, compared to more than a 50-percent chance in the general population—but that's still a 40-percent chance. You may still be able to take steps that reduce your own chance dramatically, improving your expected quality of life.

- Absolute probabilities are often most easily processed by thinking in terms of frequency. Most people do better when thinking about frequencies, especially in the middle range where events might occur or might not—for example, 60 out of every 100 people like you will develop this disease in the next 10 years. Thinking in terms of frequency helps make probabilities more concrete, especially when dealing with changes in probability.

- We rightly focus on cures and vaccines because of their power for eliminating disease, but we tend to overvalue changes in very high or very low probabilities. Steps that reduce the risk of common conditions can be much more important, even if they can't eliminate all risk.

- You should also recognize that you're not a perfect decision maker. None of us is. When you're facing a complex medical decision, you're not even at your best. You might be feeling extreme emotions, you might be stressed, and you might have ongoing depression or racing thoughts. Some disorders even affect the very systems in your brain that support decision making.

- Therefore, advice from others can be critical for making good decisions. The key is to use that advice in the right way. Avoid relying on anecdotes and stories about what has worked in the past. Stories are vivid and easy to remember, but they can also bias

us. Seek out evidence, and get others' opinions on how to use that evidence, so that you aren't facing a complex decision alone.

- Finally, be optimistic. Suppose you learn that a surgery has a 10-percent chance of failure. That focuses your mind on the negative outcome, causing it to influence your decisions. However, the same surgery has a 90-percent chance of success. When people think in terms of success, they're less likely to avoid risks unnecessarily, often making much better decisions. And that positive mindset has many other benefits for your health.

Suggested Reading

Loewenstein, Brennan, and Volpp, "Asymmetric Paternalism to Improve Health Behaviors."

Ubel, *Critical Decisions*.

Questions to Consider

1. In what ways are decisions about our health different from decisions about our finances?

2. Why might thinking about medical outcomes in terms of frequency instead of probability lead to better decisions?

Social Decisions—Competition and Coordination

Lecture 17

This lecture transitions from a focus on decisions made by individuals in isolation to decisions made by individuals in social settings, specifically settings in which two people or a small group of people interact. Regulations are often criticized because they limit our freedom of choice, and there are surely situations in which those criticisms hit their mark. But the idea that we are free to choose is based on the idea of the single decision maker, acting in isolation. As game theory shows, sometimes we're better off by restricting our own choices—as counterintuitive as that may seem.

Core Principles of Game Theory

- Economists and other social scientists have used a branch of mathematics called game theory to model interactions during strategic decision making. A "game" in this sense is basically an abstracted version of the decision situation—something that specifies the decision makers, or players, their potential choices, and the outcomes of their choices.

- During the early days of the National Hockey League, and up until the 1970s, players never wore helmets, simply because other players weren't wearing them. If one player wore a helmet, he'd be safer, but he wouldn't see or hear as well as the other players, so he'd be playing at a disadvantage. A player who wore a helmet might lose his spot on the team to someone else who didn't wear a helmet.

- Suppose that there are two similarly talented players competing for a spot on the same hockey team. They each have two potential choices: to wear a helmet or to not wear a helmet. And the outcomes each receives depend not just on their own choice, but also on the choice of the other player.

- Game theorists use numbers to represent the desirability of each outcome. In game theory, this is called the relative utility of the outcome. For this example, let's use arbitrary numbers from 0 to 10, with larger numbers indicating better outcomes—that is, outcomes with higher relative utility.

- Suppose that both players show up for training camp wearing helmets. They each have equal chances of making the team, and they are better protected from injury. So, that outcome seems pretty good for both of them—let's call it a 7.

- Suppose that one of those players now decides to play without his helmet; his odds of making the team now go up considerably, even though he's risking head injury. He thinks that's a trade-off worth making, so let's call that outcome a 9.

- But the other player is still wearing his helmet, so he's very unlikely to make the team. That's the worst outcome, even though his head is protected. So, let's call that outcome a 1.

- The following day, both players show up without helmets. They're back to a fair competition, although neither player's head is protected, and both are risking injury. So, let's call that outcome a 3.

- Clearly, the players are better off when both wear helmets than when neither wears a helmet. In both cases, the competition is fair, but the injury risk is much higher when not wearing a helmet. But they end up without helmets, in the worst collective outcome.

- This simple situation turns out to be equivalent to the most famous scenario in all of game theory: the prisoner's dilemma, an early version of the game that involved two prisoners jailed for jointly committing a crime. Each of them had to decide whether to remain quiet or inform on his partner.

- In the hockey scenario, the players will inevitably end up not wearing helmets. That pair of choices is known as an equilibrium

point, because neither player has incentive to change their choice unilaterally.

- You shouldn't think about an equilibrium point as something that represents the optimal set of choices. The players would be better off if they both wore helmets, in this case. You should instead think about an equilibrium point as a stable set of choices. It's the set of choices from which no one has any incentive to deviate on their own. For hockey players, if your competitors aren't wearing helmets, then you're only going to make yourself worse off by starting to wear one.

Coordination Games

- Not all social interactions involve direct competition. In many cases, small groups of people do best when they coordinate their behavior, especially when their interests are aligned.

- Coordination introduces its own set of challenges for decision making. Consider the following example. A group of hunters are working together to trap a stag in a forest. They each enter the forest from different directions and walk toward the center, forming a shrinking circle around the stag. As long as they all work together, the stag can't escape, and they'll each get a big reward.

- However, there's another game in the forest—small hares are plentiful and easy to catch. If one of the hunters decides to go after a hare instead, that hunter will be sure to get a small reward, but the stag will be able to escape the trap.

- In games like these, if every player cooperates, they'll all get a large reward. But if at least one person doesn't cooperate and takes the sure small reward, then all the rest will get nothing. So, cooperation depends on mutual trust; if everyone trusts the others, then the system works well. But once trust breaks down, the system breaks down.

- Many of our economic institutions rely on shared trust, and when that trust falters, there are runs on banks, collapses of industries, and other tears in our economic fabric.

Backward Induction

- Game theory is very powerful because it can take complex real-world problems and reduce them to simple models that can be solved mathematically. However, like the other models in this course, game theoretic models require assumptions about how people should behave.

- Players should be rational; they are motivated by their own outcomes. Players should think that other players are rational, too. Players can't communicate during the game and can't collude to split their payoffs after the game. In addition, there aren't any sort of hidden external influences that aren't represented in the game's explicit outcomes. These are the basic assumptions.

- By assuming that players are rational—that they consistently follow their self-interest—game theorists can find solutions to games that explain complex real-world problems. But people's behavior doesn't always follow the predictions of game theory. In particular, people can't always think through all the steps of how their choices should influence other people's choices, which should influence their own choices, and so on. That problem is known as backward induction.

- In principle, a rational player should be able to perform as many steps of backward induction as possible to reach an optimal decision—but we can't.

- Optimal choices in real-world games depend on your assessments of the rationality of the other players. And you can use your own limitations as a good guide to the limitations of the others. Your own doubt might be a good guide to others' doubt—and to the likelihood that at least one person won't cooperate. So, you switch your choice to the safe option, just like many of the others.

Focal Points

- We don't have the computational abilities to reason through all the steps of a complex decision problem. We have bounded rationality, which means that our decision processes have limitations; we don't approach these games in a mathematically optimal way. Instead, we approach problems in a way that's suited to our own computational limitations and that tries to take advantage of the structure in the world around us.

- One very powerful tool for using the structure in our world is to look for a focal point, an idea coined by economist and Nobel Laureate Thomas Schelling. Focal points have special properties that distinguish them from other choices, and thus, they facilitate coordination even when people can't communicate directly.

- For example, suppose that you and your friend have to coordinate your behavior by each selecting one coin from a bag of 100 coins, independently. If all 100 coins are pennies, you are really unlikely to select the same one. But if 99 of the coins are pennies and one is a nickel, you'll be able to coordinate. That one meaningful outlier is a focal point.

- Focal points turn out to be extraordinarily important for real-world markets. They can change competitive markets into cooperative ones, which can be very bad for consumers.

Emotion and Recommendations

- Our emotions also provide a powerful tool for our interpersonal decisions. Emotional reactions are assumed to be part of the outcomes of games—something wrapped into the utility values assigned to those outcomes. Emotion isn't seen as something that should shape the strategies players take in games; however, emotion does matter.

- The first recommendation for this lecture is that limiting your ability to make choices can give you power. Suppose that you and your friend want to meet at a restaurant. You'd rather have her come to

your side of town; she'd rather have you come to her side of town. She gets her way by calling you, telling you where she's going, and then turning off her phone.

- She has purposefully limited herself to a single choice: She can only go to one restaurant, and she can't communicate with you anymore. However, by limiting her own options, she shapes what *you* will do—she knows that you'll come meet her.

- You can't just turn off your emotions, even if you wanted to. Emotion limits our choices, but it can also give us power over others.

- The second recommendation is that cooperation doesn't always require communication. You can coordinate your choices with someone by exploiting the structure of the world, by looking for focal points.

- Focal points—like cooperation itself—aren't necessarily good or bad. Focal points can help us reach consensus in group discussions and help us negotiate to a mutually beneficial outcome. However, they can also lead to unwanted collusion. Focal points provide a potential tool for increasing the efficiency with which we collaborate, for better or worse.

- The final recommendation is that institutional actions are often needed to disrupt unwanted equilibria. In many competitive markets—for example, consumer electronics—businesses would often prefer to upgrade their products to take advantage of some new technology, such as a better plug that connects devices to computers. But they only can change their own production if everyone else also changes their production. That's exactly the sort of situation where institutional actions are most valuable. Industry groups can collectively come up with a new standard that then becomes adopted more widely.

Suggested Reading

Camerer, *Behavioral Game Theory*.

Schelling, *The Strategy of Conflict*.

Questions to Consider

1. Why don't people's decisions in interactive games match what's predicted by rational choice models?

2. What are focal points, and how do they facilitate cooperation?

Group Decision Making—The Vox Populi

Lecture 18

The idea of the wisdom of crowds has become so well known that it's hardly questioned anymore. Many people—from politicians to venture capitalists—now assume that crowds simply do better than individuals when forming judgments and making decisions. However, in this lecture, you will discover that the true nature of this phenomenon is a bit more complex than the popular story. Sometimes the crowd does very well indeed, but other times the crowd goes systematically astray—for systematic, predictable reasons.

The Wisdom of Crowds

- The wisdom of crowds is an old idea, dating back more than a century, that's continually being shaped by new research. The spark of the idea came from a short paper published in 1907 by the English social scientist and statistician Francis Galton.

- His essay, published in the scientific journal *Nature*, described data he collected from judgments of the dressed weight of an ox, as made by visitors to the Plymouth livestock show. Almost 800 people had made judgments; some of those people were ranchers or other experts, while others were just random visitors of the exhibition. Each, though, had purchased a ticket and written down their guess, in hope of a large prize.

- Galton's scientific report was prompted by an unusual feature of those guesses. Even though people's individual guesses varied considerably, the median value of the guess was very close to the true weight. In statistics, the median is just the middle of some set of numbers. In this competition, it's the guess that was exactly in the middle of the range of guesses, with half of the people guessing more and half guessing less. That median was 1,207 pounds. The actual dressed weight of the ox was 1,198 pounds, only nine pounds from the median guess.

- Suppose that you were at that same fair more than 100 years ago. You know nothing about oxen, but unlike the other fairgoers at that livestock show, you look at many of the other people's guesses. You take the middle of all those guess and write that down as your guess. You'd do much better than the typical butcher, rancher, or other expert.

- Galton described this effect as the vox populi—the voice of the people. In modern times, it's called the wisdom of crowds. It's not magic; it arises because there's always error in people's guesses. In many situations, some people will guess too high, and others will guess too low, and those different guesses will bracket the true value. If that happens, taking the middle guess from a crowd is more likely to be close to the true value than just taking a guess from a single person.

- There's a frequent misconception that the best way to aggregate data from a crowd is to take the average. The average value can be fine for some sorts of judgment, primarily when people's judgments are all on the same scale, but when people's judgments are on vastly different scales, then the average can be misleading.

- For many real-world judgments, people might not even guess the right order of magnitude—they could be off by factors of 10 or more. So, the median, or middle, guess usually provides a better estimate of the true value being judged.

- Another misconception is that it's vital to have a crowd of experts. Expertise isn't as important as two other factors. The first is pretty simple: The size of the crowd matters, to a point. As the group size increases from just a few people to a few dozen people to hundreds of people, the accuracy of the crowd's judgment usually increases. It's often better to have a large crowd of nonexperts than only a few experts. However, once the crowd becomes sufficiently large, there are diminishing returns.

Diversity

- The second factor is the primary reason for the wisdom of crowds: diversity. Diversity has become a loaded term, one that carries social and political baggage. In this lecture, diversity means something very simple: the degree to which different people approach a decision in different ways.

- Diversity isn't something absolute; it is defined with regard to something. For many sorts of judgments and decisions, we care about intellectual diversity, where people bring different information and different approaches to the same problem.

- There are many factors that influence group decision making: what knowledge each person brings to the decision, whether people share similar or different personalities, whether and how they communicate, and so forth.

Diversity in thought is advantageous to any problem that a group of people is trying to solve.

- Researchers have shown that a group made up entirely of high-performing individuals can often do worse than more diverse groups, those that contain some high performers and some low performers. That's because individuals in the diverse groups are more likely to approach the decision in different ways, so the group becomes more effective as it gets larger.

- In addition, groups whose members differ in personality will make better decisions, on average, than groups whose members have more similar personalities. Part of the explanation comes from group dynamics; groups with diverse personalities are more likely to challenge each other in discussions. Our personality can predict, albeit imperfectly, some aspect of how we approach decision problems. Thus, diverse personalities make groups or crowds more effective decision makers.

- In some ways, communication at the wrong time is the enemy of good decision making. Social influence through communication before making decisions can disrupt the wisdom of crowds. Communication from a few prominent individuals in advance of decisions can reduce the diversity of the crowd and potentially introduce bias.

- In real-world judgments, the wisdom of the crowd can be systematically biased by media reports, by very salient news events, and by the opinions of a few influence makers. What's particularly striking is that people often become more confident when they are exposed to less diverse information.

- There's a surprising potential solution, though. Researchers have shown that uninformed people can actually help stem the tide of biased communication.

Limitations

- It's easy to get caught up in the power of crowd decisions and to lose sight of when crowds fail. Crowds fail when they have a shared error in judgment. And when that's the case, there's a deeper

problem: The people who are most confident about their judgments are often the most wrong.

- When the crowd tends to get a judgment right, the people who are more accurate tend to be more confident. But when the crowd tends to get a judgment wrong, then confidence is higher in people who are more inaccurate.

- We think that confident people are more likely to be right, and we place our trust in them. But just because someone is confident about their judgment doesn't make them accurate—they're just more likely to be like the rest of the crowd.

- We can be overconfident in our own judgments as well, and that can also cause the wisdom of crowds to fail. When betting on football games, casual gamblers generally prefer to bet on the favored team, even though the advantage of the favorite is essentially negated by the point spread, or betting line. Systematic biases like this one can reduce or eliminate any advantage of crowds.

- In addition, crowds fail when people ignore them. In many of our decisions, we have the opportunity to collect information from other people, but we tend to undervalue that information.

- When people receive advice from someone else about a judgment, they tend to adjust their judgment by only about 25 percent toward whatever the advisor recommended. This number is itself an aggregate across three types of people: Most people ignore advice and keep their original judgment, some split the difference between their original judgment and the advisor's, and a small minority actually adopt the advisor's position.

- This pattern of results means that people treat their own judgments as much more accurate than someone else's. They don't use information from other people as much as they should, even when those other people should be just as good at the judgment or decision.

- And people don't recognize the importance of sample size. When given the choice of following the advice given by one confident person or the aggregate of several less confident people, a majority of people will choose to follow the confident person. Remember, people tend to overestimate the quality of their evidence and underestimate the importance of the quantity of evidence.

- However, confidence isn't necessarily predictive of accuracy. In fact, situations where one confident person disagrees with a group of less confident people are precisely those in which the confident person is most likely to be wrong.

Using the Wisdom of Crowds

- Using the wisdom of crowds can lead to good decisions in some circumstances and poor decisions in other circumstances. The main challenges lie in knowing when to use the wisdom of crowds and in how to improve the process of decision making so that crowd-sourced decision making can be more effective. The following are three recommendations, each of which applies to a wide range of decisions.

- The first one is the simplest: Diversity matters. Take it seriously. Groups tend to be more effective than individuals when they consist of a diverse set of individuals who bring different perspectives to a decision. However, groups are actually less effective than individuals when they aren't diverse—when different people bring the same biases to the decision.

- Second, encourage people to make independent contributions to a decision. You can have a large group filled with people who bring different perspectives, but if that group communicates before people think independently about that decision, then the advantage of their diversity may be lost.

- Communication isn't always a good thing. In the extreme case, where group members prioritize social cohesion over independent thought, communication can actually lead to closed-mindedness, where

people think much more alike than they really should and become overconfident in the accuracy of their beliefs. This phenomenon is known as groupthink, and it's most evident when a small group of similar people works together on a high-pressure decision.

- Finally, you can use the wisdom of crowds to make better judgments and better decisions by simulating a crowd of two—in your own guessing. When people make two guesses after thinking about different information, or after just waiting a while, the average of their guesses turns out to be a better estimate than one guess in isolation. So, don't get fixated on a first guess. Force yourself to think again, consider what else is important, and make a new estimate.

Suggested Reading

Koriat, "When Are Two Heads Better Than One and Why?"

Surowiecki, *The Wisdom of Crowds*.

Vul and Pashler, "Measuring the Crowd Within."

Questions to Consider

1. What factors drive the wisdom-of-crowds effect?

2. What circumstances lead crowds to make the wrong decisions?

Giving and Helping—Why Altruism?

Lecture 19

This lecture moves from gaining information from others to making decisions about others. In this lecture, you will explore prosocial decisions like helping others and giving to charity, and you will see how decisions about others can be very different from decisions about ourselves. This lecture explores why we often act in ways that help or hurt others, even when those actions might not be in our own interest. We can't guarantee that our actions—well intended as they may be—will lead to success. But by helping others, we may end up helping ourselves.

Why Do We Give?

- There's a strand of research in economics that considers motivations beyond one's own interest—what are known as other-regarding preferences. Preferences about one's own outcomes are self-regarding preferences; preferences about others' outcomes are other-regarding preferences.

- Other-regarding preferences can be much more difficult to explain than self-regarding preferences; we often don't know why someone sacrifices of themselves on behalf of another. But there's a general theme that separates self-regarding and other-regarding preferences. Other-regarding preferences are often connected to our sense of identity. How we see ourselves, and how we see others, shape whether and how we give to others. And, in many cases, our sense of self leads us to value some public good or a social norm over our own interests.

- Why do we give of ourselves to help others? Are we really altruistic? The term "altruism" has been defined—and criticized—in many ways; the following is a simple definition: Altruistic actions reduce one's own well-being to fulfill an other-regarding preference.

- Altruism isn't supporting your kids or helping your other relatives. Doing so provides clear personal benefits to you—or at least to your genetic fitness. It isn't showing reciprocity to your friends or entering into alliances of convenience with your enemies. Acts aren't altruistic if they are done strategically, in anticipation of some reciprocity later—that's closer to cooperation than altruism.

- Not all good works are altruistic. When a major corporation starts supporting the Red Cross or a local school system, that support might be driven by the desire to change a brand image instead of helping those less fortunate. And altruism doesn't require that someone obtain no benefit from one's action, just that the benefit doesn't outweigh the cost.

- Economists think about altruism in the context of public goods—things like national parks, highway systems, a clean environment, or public radio or television channels. A public good is something that benefits many people, all of whom want the public good to continue to exist. However, because most public goods can be accessed without charge, there's little incentive for any one person to contribute to their upkeep. People can become free riders, using the public goods without paying for them.

- This problem is solved in different ways for different public goods. Some public goods, like national parks and highway systems, are supported primarily by forced contributions through taxes. But others, like public radio and television, need substantial support from charitable giving.

- To explain why people donate to such public goods, economists have assumed that people are altruistic; they want the public good to exist, and they give of themselves—independently of any other motive. Economic models of public goods have made some strong predictions about how people should behave, if they are motivated by this sort of altruism.

- One strong prediction is that government support through taxation should substitute for, or crowd out, personal giving. This is because both taxation and private gifts have the same effect on the public good. Another prediction is that charitable giving should show strong income effects. If the public good is equally valued by everyone, only the wealthy would give, because only to them is the donated money insignificant enough to be outweighed by the public good. But we know that these predictions aren't true.

Charity: Social Benefits

- Charitable giving can't be explained by pure altruism. There are a few alternative explanations: one involving external benefits and the other involving internal benefits.

- Charitable giving carries noneconomic benefits, particularly in terms of social status. It provides entry into particular social networks, those in which other givers circulate. Giving can provide status, and charitable giving can be a socially acceptable signal of wealth.

- Evidence that people are motivated by the noneconomic benefits of giving has been found in a surprising place—the annual reports from charities that have tiers of giving. Some charities list their donors by tier in their annual reports.

- If the charity lists the total amount donated by each tier, as well, you'll probably find that the total is pretty similar to what would be expected if most people gave the minimum amount necessary for a given tier. That's consistent with the idea that people don't decide on a gift and then see which tier they fall into. Instead, they use information about tiers to calibrate what they want to give, based on the status they want to signal.

Charity: Warm Glow

- Noneconomic benefits surely motivate many people to give. If anything, some people will be motivated by the desire to avoid scorn; they don't want to be seen as a deadbeat or free rider by their

peers. But we need more to explain why people give even when social status is minimal.

- Research in economics, psychology, and neuroscience now all converges on an alternative explanation: that people are motivated by internal benefits. The very act of giving leads to a good feeling about oneself—what's sometimes called a warm glow feeling—that provides utility to those who give.

- The economist James Andreoni has incorporated the idea of a warm glow feeling into a model of what he calls impure altruism. This model can explain real-world charitable giving better than models based on pure altruism. If people give, in part, because giving feels good, then government subsidies shouldn't completely offset private giving. Tax dollars that support public radio don't substitute for one's own gift, because the tax dollars don't lead to a warm glow.

- In addition, impure altruism can explain why people give to public goods that have a very large reach, such as the Red Cross or a national park. When many people could give, the incentive for any one person to give is very small; one person's gift isn't likely to make much difference in the existence of the public good. However, if people are motivated by the feeling they get by acting altruistically, then they'll still give even when they know others are likely to give, too. Impure altruism is a powerful idea, and it can explain some anomalies in charitable giving.

Even though charity involves donating money, time, or resources, it carries noneconomic benefits to the provider.

Social Cognition Explanations

- The warm glow we feel when giving to a deserving charity explains why we choose to give our own money to support a charity, rather than depend on the generosity of others, but it doesn't explain why we give to some causes and not others. Of course, we each have our own reasons for giving and our own personal set of causes to support. But there's one factor that seems to be critical for encouraging people to act on their other-regarding preferences: seeing others in need.

- People are more willing to give when they know that a specific, identifiable other person will benefit from their actions. This isn't necessarily a good approach to charitable giving. When a child's suffering makes the national news, spontaneous donations to that one child might total hundreds of thousands of dollars. Such giving is very generous, but it helps only one person or one family—at the expense of many others who might have similar needs.

- In addition, people are often less willing to give when many thousands or millions of people need help, as when famine afflicts an entire region or when war or genocide tears a country apart. In a general sense, the larger the problem, the less likely it is to elicit charitable giving. What could explain this paradox: We give to the few, but not to the many?

- When one person suffers, we can empathize with them or their family. We can imagine what it must be like to experience some tragedy. We engage in what psychologists call social cognition mechanisms—processes that help us understand someone else's thoughts, goals, or feelings. And we can envision how our donation could make that person's life a little better.

- But when a tragedy affects many people, we think about the harm to the community—the number of people homeless, the size of the area affected by famine. We can't empathize as easily with one person; there might not even be any identifiable people whose stories are being told. And we can't imagine how our minor contribution could

possibly make a difference in such a terrible situation. So we shake our heads, mutter at the unfairness of life, and move on.

- As a general rule, people are more likely to give when they can identify and empathize with specific people who will benefit from their generosity. This rule doesn't mean that the only thing that matters is having a single identifiable target; instead, think of it as saying that the more identifiable the target, the more likely the giving.

- A consequence of this rule—giving is greater to an identifiable target—is that giving should also be reduced when people can't or don't empathize with those in need. We don't empathize with the person who seems like an outsider, a member of a different group, or someone not like us. Those people are dehumanized, to use a term from social psychology. And, sadly enough, when people are so affected by ongoing tragedy that they don't seem like us anymore, then they don't engage our processes of social cognition. They don't elicit our empathy, or our charitable gifts.

Encouraging Charitable Giving

- We can't just tell people that their decisions are biased and expect change. It's more effective to identify ways in which people can use their biases as tools to make better decisions. To encourage charitable giving, there are two primary tools.

- First, giving comes in part from an internal sense of motivation—the warm glow we feel when helping others. If you are running a charity, you should make that motivation as tangible as possible. Build a community of givers. Tell donors that they are part of your community, that they are one of you. Provide testimonials not only from the people who benefit, but also from the people who give. Emphasize the success of past fundraisers, not the challenge of reaching the goals. Potential donors want to feel like winners, like they are part of something great. Don't scare donors; celebrate them.

- Second, people are more likely to give to identifiable other people in need, not to masses affected by a tragedy. A good approach is

to make the tragedy personal. Tell stories about specific people in need. Humanize them. Focus on the mundane, the normality of life before the disaster. Describe what specific people were doing beforehand—how they were thinking about what to eat for dinner or how to save for their kids' future. Don't present generic disaster victims but people whose full lives have been disrupted by tragedy.

Suggested Reading

Fehr and Fischbacher, "The Nature of Human Altruism."

Harbaugh, Mayr, and Burghart, "Neural Responses to Taxation and Voluntary Giving Reveal Motives for Charitable Donations."

Questions to Consider

1. What is impure altruism, and how does it help explain the prevalence of charitable giving?

2. Why might people be less likely to give following large disasters than small tragedies?

Cooperation by Individuals and in Societies

Lecture 20

Cooperation is a fundamental feature of social life. But encouraging cooperation, and enforcing it, can be surprisingly difficult. In this lecture, you will learn about cooperation—why we work together for mutual gain. Cooperation seems like a prototypic phenomenon within behavioral economics, but it has importance that goes well beyond behavioral economics, and we shouldn't underestimate how cooperation is shaped by traditional economic, political, and cultural institutions. It's present in all human societies, but it can take very different forms.

Cooperation

- The trust game is a simple game that allows us to measure cooperation in the laboratory. This game is played by two people at a time: an investor and a trustee. For now, imagine that these people are sitting at computers in two different rooms; they don't know each other's identity, won't meet each other during the game, and can only communicate through their decisions in the game.

- When the game begins, the investor is allocated a starting endowment of 20 dollars, for example. Then, the investor must decide how much of the money to invest with the trustee. Any money invested is multiplied by some factor—let's say that the money is tripled. So, if 10 dollars were invested, then the trustee would have 30 dollars. The trustee then decides how much money to give back to the investor and how much to keep.

- This is a powerful game because it distills trust down to its essence—the belief that another person will reciprocate a prosocial action, even against their self-interest. What would rational, self-interested players do if they played this game once? What should you do, if you are playing?

- Suppose you're the trustee. A random, anonymous person has just given you 30 dollars, and there's nothing forcing you to send any money back. So, if you are purely self-interested, you should keep the money. A self-interested trustee should keep any money given to them. Knowing that, a self-interested investor shouldn't invest anything; there should be no trust in the trust game.

- But that equilibrium solution—no investment, no repayment—only rarely happens. Most people invest at least some money. Across many different studies, the investors typically send about 50 percent of their initial endowment to the trustee. And most trustees return a significant amount of money, but a substantial minority do not. On average, trustees return slightly less than what the investor sent.

- There's considerable variation in this game. Some of the time, investors benefit from being trusting, but often they don't. And there's also evidence for cultural variation. This game has been used in experiments in many different countries, and the varying outcomes point to the potential for quantitative measurement of something that seems so subjective—trust.

- However, real-world cooperation often involves interactions among people in groups. When the trust game is expanded so that people aren't interacting with a single partner, but with someone randomly chosen from a group, there's a notable change in people's behavior.

- In one experiment, there was a group of investors and another group of trustees. When a given trustee received an investment, their repayment could go to any of the investors, not necessarily the one who initially invested.

- In this situation, the rate of reciprocation drops dramatically. People no longer expect others to behave fairly, because there's no ability to track others' actions, and thus, people can't build up a trustworthy reputation. If interactions are just random and anonymous, people can't send signals that they are trustworthy nor send signals that disapprove of others' behavior.

Signaling

- What leads to cooperative behavior in the real world? There are three types of explanations: signals, norms, and enforcement.

- When people interact in social settings, their actions send signals about their intentions. We can send signals in many ways—through our body language, through our tone of voice, how we move toward or away from someone.

- When people interact in laboratory games, though, the researchers don't necessarily want to allow all of those realistic signal; they're just too complex to easily characterize. Instead, people need to send signals through their actions in the game, whether their decisions signal an intent to cooperate or to compete.

- In a clever study, a team of economists and neuroscientists brought two people to the laboratory to play the trust game against each other. However, in a twist, the two players each went into their own MRI scanner, and the two scanners were synchronized so that images of both players' brains were collected simultaneously while the players played the game 10 times in a row with each other.

- They found that when players interacted in a benevolent way, such as when a player increased the amount they sent to their opponent from one game to the next, there was increased activation in a brain region called the nucleus accumbens, one of the major targets for the dopamine neurons that guide how we learn about reward.

- What's even more interesting was how this brain activation changes as the two players develop trust. In the first few games, the brain activation occurs relatively late in each game, after the investor makes an investment that shows trust. However, as the two players start to trust each other more and more, the activation in this brain region moves earlier in the game. It now anticipates the investor's signal that he or she is willing to trust.

- Cooperation is rewarding, and as we develop trust, that sense of reward is not only present following cooperative acts, but also when we first receive a signal of cooperation.

Social Norms

- Signaling is clearly important for cooperation, but it can't explain the variety of real-world cooperation that people show. We often cooperate with people we've never met, even before we've received any signals from them. And we do that because of what are called social norms, which are generally accepted rules about how we should behave.

- Economists and psychologists generally advance three explanations for the social norm of cooperation. The first explanation is simple: We cooperate because of a sense of altruism. We want to help our social partners. However, pure altruism only works in very limited circumstances that don't really apply to social cooperation.

- Impure altruism assumes that we have an internal feeling—a warm glow—that motivates us to help others. That's consistent with the sense of reward that we get from interacting with a specific partner, but it doesn't explain why we have social norms that encourage cooperation.

- A second explanation is that of inequality aversion. People dislike it when what they receive differs from what someone else receives. The behavioral economist Ernst Fehr and his colleagues have shown that incorporating inequality aversion into their models allows them to predict whether people will cooperate or be selfish in economic situations. Their inequity aversion model implies that in some situations, people will be willing to sacrifice some of their own money in order to reach a more equitable outcome. Inequity aversion can explain some biases in people's choices, but by itself, it can't explain the prevalence of cooperation.

- The third explanation is that of reciprocity. In terms of intentions, reciprocity can be defined as follows: When we interact with others,

we make judgments about their motives, and then we act in the same way. We reciprocate good intentions, leading to cooperation. Reciprocation, like inequity aversion, provides a potentially necessary condition for cooperation. But it isn't sufficient. We still need some enforcement mechanism.

Altruistic Punishment

- Suppose that you are watching two other people play a trust game. The investor offers everything to the trustee, but the trustee keeps everything. The trustee breaks the social norm of cooperation. Now also suppose that you have the opportunity to spend five dollars of your own money to punish the uncooperative trustee; if you spend five dollars, the trustee will lose 20 dollars from their ill-gotten gains.

- People are willing to engage in such altruistic punishments—in both laboratory and real-world situations—in order to enforce social norms. They get angry at the cheaters, and that emotion pushes people to take actions against their own self-interest.

- When people engage in altruistic punishment, there are two primary effects. First, it corrects deviant behavior when a partner fails to cooperate; the punished cheater cooperates in the next game. Second, altruistic punishment increases one's confidence that an unknown partner will cooperate in the future.

- If people can't be punished for failing to cooperate, then social cooperation unravels with even a few bad apples. People see antisocial behavior that goes unpunished, and they lose confidence in others. That leads to a cycle of diminishing cooperation over time. But if altruistic punishment is possible, a few good apples can enforce cooperation even in very large groups.

- Altruistic punishment is powerful but expensive. It requires time and energy to confront someone who is disturbing their social group or shirking their duties in the workspace. Even if you have good intentions, you might not find altruistic punishment worth the effort.

- However, when someone misbehaves in your social group or workplace, often multiple people will be affected by their misbehavior. Therefore, corrective actions don't have to come from one person in isolation, but can come from a group in coordination.

- Conditional cooperation involves cooperating when cooperating is deserved but punishing when that's necessary. Real-world groups that include a substantial portion of conditional cooperators are better able to manage their shared resources.

Altruistic Reward

- As opposed to altruistic punishment as a method for enforcing norms of social cooperation, there's another possibility: altruistically rewarding people who cooperate with you. The key advantage of reward, compared to punishment, is that it promotes social ties. Rewarding someone builds a social relationship with him or her. Punishments, on the other hand, break down social ties. Altruistic punishments can be used as weapons or threats.

- There's much less known about altruistic reward, compared to altruistic punishment, but the best evidence suggests that reward might work at least as well as punishment in encouraging cooperation.

- If altruistic punishment and altruistic reward are both effective and encourage cooperation, why might we prefer only altruistic reward? Altruistic punishment takes away resources, either because of literal costs or lost time or energy. Altruistic punishment makes the group worse off, overall. But rewarding someone doesn't make the group worse off; it just transfers money from one person to another. Altruistic rewards serve as signals of trust that don't reduce the overall resources of the group.

- We know much more about how altruistic punishment can enforce cooperation than about how altruistic reward can encourage cooperation, but there's something reassuring about the idea that cooperation doesn't necessarily need enforcement through punishment, if the right incentives can be provided at the right time.

Suggested Reading

Bshary and Grutter, "Image Scoring and Cooperation in a Cleaner Fish Mutualism."

Henrich, et al, "Markets, Religion, Community Size, and the Evolution of Fairness and Punishment."

Questions to Consider

1. Why is conditional cooperation so important for group dynamics?

2. How does altruistic punishment facilitate cooperation?

When Incentives Backfire

Lecture 21

Money serves as an incentive for our behavior. We are more likely to seek out jobs that pay more money rather than less. When we shop, we prefer to spend less money rather than more. The fact that money serves as an incentive for behavior is central to our economy—and to almost every other facet of our lives. In this lecture, you will learn about one of the more striking findings from recent research in behavioral economics, psychology, and neuroscience: Economic incentives can backfire. They can actually discourage behavior rather than encourage it.

Reward Undermining

- The phenomenon where an incentive decreases motivation for a behavior has several names, one of which is reward undermining—when the external incentive undermines the sense of internal reward that normally motivates our behavior.

- Reward undermining is an extraordinarily powerful idea. Incentives can not only undermine small-scale interpersonal interactions, but also very large-scale social policies. Research has shown that economic incentives can decrease, or potentially even eliminate, people's actions to benefit an important social good, like blood donation.

- There are two different sorts of motivation: external and internal. External motivation and internal motivation aren't just two factors on the same scale of utility; they may represent different scales altogether.

- Economic theory has historically given pride of place to external sources of motivation. A monetary incentive, for example, should have much greater influence on behavior than any internal factors. In addition, external incentives should have more consistent effects, too. People should all be motivated by money in a generally similar

way, even if their internal motivations are very different. However, reward undermining argues that internal sources of motivation can be more important, at least some of the time.

- What determines whether external incentives or internal motivations shape our decisions? One answer is that there are actually two different currencies for decision making. One currency is economic—our choices lead to physical gains and losses, good outcomes and bad. The other currency is social—our choices change how other people see us, or how we see ourselves.

- Different incentives change the currency in which we make our decisions, from social to economic, or vice versa. Monetary incentives change the context of a decision from a social relationship to an economic transaction, from social currency to economic currency.

- Money changes how we think about our social relationships. We resist lending money to friends and family—not because of the value of money, but because of the value of our social ties. We don't want to think about money whenever we think about our friends, and we don't want to risk our friendship over a loan.

- Incentives can work in the opposite way, too: Social relationships can change how we think about economic incentives. Salespeople in many industries know this. They want to build social relationships with their customers so that the customers choose their firm among many in a crowded marketplace. And we expect reciprocity in our social relationships. Gifts and favors are reciprocated—perhaps not consciously, but reciprocated nonetheless.

- These two currencies, economic and social, can compete with and even undermine each other, potentially leading to bad decisions.

Psychological Explanations

- There are some different explanations for reward undermining. The first category of explanation comes from psychology, and it focuses

on the idea of motivation. A core concept in social psychology is that people don't simply know the reasons for their actions; instead, they have to infer their own reasons based on potential external and internal motivators.

- In one kind of reward undermining, initially called the overjustification effect, the external prize is enough to justify the behavior, so it prevents internal motivation from developing. This is an early undermining perspective, because it proposes that external incentives prevent internal motivation from forming in the first place.

- Alternatively, undermining might happen more gradually. Many studies have shown that external incentives don't necessarily extinguish internal motivation, especially if those incentives are infrequent and unexpected. For example, nearly all students in the United States are constantly exposed to external incentives, in the form of grades, and many of them remain curious and inquisitive learners.

- So, a late undermining perspective would propose, instead, that external incentives won't undermine internal motivation immediately, but will instead have effects later, as they are delivered repeatedly.

- It is very difficult to discriminate between these two perspectives, but the key message is that we now know that motivation is an important contributor to reward undermining, but it isn't the only contributor.

Reward

- Deep in the brain are neurons that use the chemical dopamine. Those neurons send signals to brain regions that help us learn so that we can learn to make choices that lead to good outcomes and avoid choices that lead to bad outcomes.

- Dopamine is not associated with pleasure, but instead with motivation. Rats whose reward system has been disrupted by brain

damage show normal facial expressions of pleasure when food is placed in their mouths, but they aren't motivated enough to cross their cage to eat, even if they are hungry.

- So, if undermining is associated with disrupted motivation, as these psychological theories contend, then undermining should also disrupt the function of the brain's reward system.

- Recall that range effects occur because our sense of a meaningful difference in some quantity is inversely proportional to its range. It's reasonable to assume that the range in the activity of our reward system will be smaller when we're just playing a game for fun than when we're playing a game for money.

- There's good evidence that external rewards—particularly money—have greater effects on our reward system than internal rewards like satisfaction. There's a good reason for that: Those external rewards are very important for learning about the consequences of our decisions.

- From the perspective of our reward system, reward undermining is like a range effect. When an external incentive is provided, it increases the range of rewards to which our reward system responds, and internal rewards seem small by comparison. However, if all we experience are internal rewards, then those rewards seem much more important.

Incentives as Social Signals

- Motivation isn't the whole story. Sometimes monetary incentives backfire in a way that can't easily be explained in terms of diminished motivation.

- Consider the following proposition: If there is a nuclear storage site in your community, then you will receive thousands of dollars yearly. When someone offers you money—particularly when they offer you a lot of money—you don't think that they are doing it out of the goodness of their heart.

- Incentives in economic transactions send signals about other people's motivations. If the government offers you money, they must want you to sacrifice something in return. And if a nuclear storage site is built in your community, you might be sacrificing your health, your children's health, and the local environment. When we bring those potential disadvantages to mind, the incentive backfires.

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Paying children to play video games might lead them to view it as "work," which might lead to a decline in play.

- Incentives can also signal that someone doesn't trust us to make the right decision. Paying children to avoid a desirable behavior—for example, playing video games excessively—sends a very strong signal: Video games are really fun!

- There's a somewhat paradoxical prediction here. You shouldn't pay kids to avoid video games, in part because that sends the wrong social signal. What might work much better is paying kids to play video games. Make the game as work-like as possible so that their performance in the game earns them small amounts of money, and that money may undermine their internal motivation for the games.

- The presence of an incentive sends social signals. The opposite is true as well: When people take actions without incentives, it also sends social signals—to themselves and to others. When we act without external incentives, it says something about us. When we sacrifice of ourselves, when we take risks without any obvious external cause, then we signal that we're motivated by internal causes. We show others that we're not the sort of person who can be

bought. We act because of our principles, our desire to help others, our honor.

When Do Incentives Work?

- When and how do incentives work? This isn't just a question for economists and policymakers. We all use incentives. The following are four guidelines about when incentives work—when they don't backfire and don't undermine our behavior.

- First, incentives work when they establish social norms. Pro-conservation messages in hotel rooms that ask you to help save the environment by reusing your towels work best when they say something that suggests a social norm—for example, 80 percent of guests in this hotel were willing to reuse their towel.

- Other incentives, like small taxes on disposable plastic bags, have had mixed success, often because reduced consumption in one area is offset by increased consumption in another. However, they have been most successful when they establish a social norm: People now see the prosocial behavior as what good people do, rather than as the outcome of an economic transaction.

- Second, incentives work when they expose us to a good outcome. Suppose that you want to encourage your kids to eat more vegetables. An economic incentive could help. In one study, an incentive to eat vegetables broke down children's initial resistance to vegetables, and then they developed a taste for those vegetables over repeated exposures.

- Third, incentives work when internal motivation is absent or already crowded out. People are willing to pay money to ride their bikes, read novels, or work in their gardens. Many people find all of those tasks to be interesting. But people must be paid to work as a bicycle courier, to proofread magazine articles, or to clear other people's gardens. These tasks aren't interesting, or personally relevant, so incentives are critical.

- One solution for this problem is to provide minimal cost incentives—shaping behavior by providing positive feedback or by noting milestones, rather than by giving money. Many online sites have adopted this approach in what is known as gamification, which is the act of converting otherwise boring tasks into games.

- Fourth, incentives are better at encouraging good performance than at shaping our decisions. Incentives work very well in many situations. For example, people work harder and for longer periods of time when they can earn more money. That's a core principle of labor economics, and it's easily observed in workers' willingness to work overtime for a higher rate of pay.

- However, research indicates that incentives are less good at motivating people to engage in an action when they have free choice. What economic incentives can undermine is our motivation for specific choices—for better or for worse.

Suggested Reading

Frey and Jegen, "Motivation Crowding Theory."

Gneezy and Rustichini, "A Fine Is a Price."

Questions to Consider

1. Under what circumstances can economic incentives backfire, reducing the behavior they were intended to increase?

2. Why might small gifts—such as a pharmaceutical company sending a mug to a physician—have large effects on the recipient's behavior?

Precommitment—Setting Rationality Aside

Lecture 22

In this lecture, you will learn about one of the most powerful tools for making better decisions: precommitment. When you precommit to something, you are making a binding decision ahead of time, essentially locking in a choice option now rather than keeping flexibility for the future. It seems strange to want to precommit ourselves to a course of action. We usually value flexibility in our decision making; we want to keep our options open. However, as you will learn in this lecture, giving up that flexibility can often lead to better decisions.

Precommitment Explained

- Precommitment is a very powerful approach to improving decision making. It works, and it works well, especially under the right circumstances. A precommitment is a decision now to limit one's possible decisions in the future.

- Precommitment works, in large part, because we know that we don't always make good decisions. We think about ourselves in the future—perhaps facing some new temptation—and we don't trust that future self to make a good decision. So, we bind our future self's hands to prevent mistakes.

- If you're like most Americans, you've made New Year's resolutions before—whether to lose weight, volunteer more in your community, or take up a new and time-consuming hobby. And if you're like most Americans, you didn't keep all of your resolutions. Just resolving to do something doesn't help much. And it can actually backfire. Just making a resolution about your goal can make you less likely to take action to reach that goal.

- New Year's resolutions aren't binding. Therefore, resolving to do something can substitute for real action. We're comforted by our plans to get in shape. We become confident that our resolute future

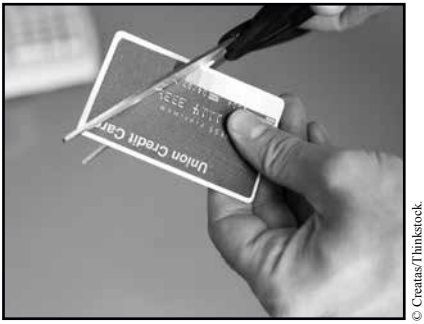
self will exercise regularly and eat well, which gives our present self permission to indulge.

- Resolutions aren't completely useless. They can highlight important goals and thus provide a roadmap toward some desired outcome. But they aren't binding, and thus, they can backfire on us.

Costly Precommitment

- Precommitment works best when it is credible—when people can't readily change the committed course of action because of the effort required, because of a financial cost, or because the decision is irrevocable.

- A common example is that of cutting up one's credit cards to prevent future spending. But precommitment doesn't have to be so extreme. If you know you tend to overspend when shopping for holiday presents, then just resolving to spend less is unlikely to be effective. A better step toward responsibility would be to leave credit cards at home when shopping; by only bringing cash, you set an upper limit on what can be spent during that shopping trip.



An example of precommitment is cutting up your credit cards so that you cannot use them.

- Credible precommitment has been used to help addicts and people at risk for addiction manage their behavior. Many casinos have self-exclusion programs that allow patrons to establish binding limits on their play. For example, you could voluntarily establish limits on how much you can bet, how much credit you can be extended, or even whether you can enter a particular casino.

- Credible precommitment works even for problem gamblers; they can't feed their addiction when they can't enter in the first place. However, when a commitment isn't credible—like when casinos or states remind people about the dangers of gambling but don't bar entry into the casinos—then it doesn't help problem gamblers and has only very limited benefits for everyone else.

- People engage in precommitment at great potential cost to themselves. They'll purposefully establish penalties for missing deadlines in order to motivate themselves to complete tasks. Research by the behavioral economist Dan Ariely and his colleagues showed that costly precommitment really helps, especially when people are sophisticated about how they set their deadlines.

Emotions as Precommitment Devices

- Precommitment works when it binds us to a course of action—when we can't change from our original plan without penalty. This aspect of precommitment turns out to be critical for ensuring cooperation in social interactions.

- When we interact with others in economic settings, we need to convince them that we can be trusted—that our promises bind our future actions. In modern society, there are external tools for making binding promises, like legal contracts. Our reputations also suffer when we break our promises, and people will readily punish promise breakers in order to enforce social norms.

- However, what about very simple sorts of economic interactions, like two people haggling over a price, where there are no contracts and no reputations to consider? What can cause people to cooperate for mutual benefit? Promises aren't enough; most verbal promises are just cheap talk without any precommitment mechanism. So, we need some way to bind ourselves to a course of action so that we can't take a different action later.

- The economist Robert Frank argues that our emotions make our promises credible. Think about anger. You can tell if someone is

really angry—you can see it in their face, in the tensing of their muscles, how they stomp around the room with undirected energy. And that anger does not dissipate instantaneously; instead, it takes time to dissipate, and all the while, you're fearful of what that angry person might do next.

- When we receive clear signals that someone else is committed to a course of action, even if it wouldn't be in their self-interest, it shapes our actions. We back down in negotiations, for example.

Institutional Precommitment

- Precommitment can be a powerful tool for making good decisions, and it's been recently applied by a range of institutions—both governmental and nongovernmental—in hopes of shaping real-world decisions.

- A striking example has come in the realm of organ donation. Making one's vital organs available to others, in the event of death, can save the lives or improve the quality of life of several other people. Organ donation has extraordinary social benefits, but in many countries, too few people register to be donors.

- In the United States, donor rates have risen steadily as people become more aware of organ donation and as signing up becomes increasingly convenient. But participation remains lower than it should; only recently has the proportion of eligible donors risen above 40 percent. In addition, many of our peer countries have similar or lower rates.

- But in some countries—such as France, Hungary, and Portugal—nearly 100 percent of all adults are registered organ donors. Is this because their citizens are more altruistic than Americans? No. It's because those systems use an opt-out approach to organ donation: Everyone is assumed to be a donor, unless they expressly indicate that they wish to opt out of the donation program. But almost no one does.

- A simple difference in policy—from opting in to opting out of donation—dramatically increases the number of eligible donors. This seems like a relatively noncontroversial use of precommitment and of behavioral economic methods, more generally. Thousands of additional lives are saved yearly in these countries; there's a clear benefit to their societies.

- Most people report approving of organ donation. In fact, within the United States, the number of people who support organ donation has historically been much larger than the number of eligible donors. So, the precommitment approach pushes them toward making a decision they'd prefer anyway. In addition, those people who don't wish to become organ donors can still decline participation, if they choose.

- However, even this case raises ethical issues. Think about someone who is really against organ donation—who doesn't wish to participate—but because he or she is susceptible to all the same biases as the rest of us, he or she doesn't take any action to change the default. People like this would end up being an organ donor—in a sense, against their wishes—because of their own inertia.

- There are obvious counterarguments. There's still an enormous societal benefit from increasing the pool of organ donors. And even this hypothetical person still could have opted out, if he or she had just mustered the energy. So, that's hardly the most compelling case against an opt-out plan.

- Even the nonbinding precommitment of an opt-out program involves ethical tradeoffs. Precommitment works. People stick with default options—perhaps because they really prefer that option, perhaps because of their own inertia, or perhaps because the default establishes a new social norm.

- So, changing the organ donation program from opt-in to opt-out program changes that program's mistakes. An opt-in program misses people who really prefer to participate but haven't enrolled,

while an opt-out program includes people who would rather not participate but haven't withdrawn.

- For organ donation, this tradeoff seems justified; almost everyone benefits from the move to an opt-out program. But it isn't hard to imagine a circumstance in which a precommitment strategy might not be so benign—for example, a dubious investment vehicle—one where many people end up, by default, making decisions against their preferences.

Precommitment Strategies

- We can easily use precommitment strategies in our everyday lives, and they don't have to be as extreme as cutting up our credit cards. Most of the time we use precommitment to avoid temptation, for which it is very effective. Indeed, the best approach to managing temptation is to avoid it in the first place.

- Don't trust your future self to make good decisions. It'll be just as hard to skip dessert tomorrow as it is today. Help out your future self by precommitting. If you rarely have money at the end of each pay period to invest for the long term, force yourself to save money by an automatic payroll deduction, which is more likely to be successful than trusting in your future willpower.

- In addition, avoid empty commitments. Just making a resolution isn't enough, and small steps toward a large goal can backfire. Make small commitments that are readily managed, and make them credible; you're better off if there are specific outcomes that depend on meeting your goals.

Suggested Reading

Frank, *Passions within Reason*.

Johnson and Goldstein, "Do Defaults Save Lives?"

Questions to Consider

1. Why are opt-out approaches to retirement saving so effective?

2. How do our emotions facilitate precommitment?

Framing—Moving to a Different Perspective

Lecture 23

In this lecture, you will learn about a second key tool, the first being precommitment, that changes the way you approach a decision: framing. This lecture will begin with some examples of framing to give you a sense of just how powerful it can be. Then, it will explore three types of frame—value frames, temporal frames, and goal frames—before ending with overall recommendations about how we can use framing to make better decisions.

Framing

- A framing effect arises when people make different choices based on how a decision problem is presented or interpreted. In framing, the core features of the decision problem don't change; people still have the same options and the same potential outcomes. But something changes in how people think about that decision problem, leading to different choices.

- There are multiple ways in which decisions can be framed. In economic decision making, frames can alter how we balance different factors, such as probability versus reward magnitude. In consumer choice, framing shapes what's important to us in our decisions—whether we prioritize the safety features or the engine performance of a new car. In addition, when we plan for the future, framing influences what goals we pursue—whether we seek to obtain a good outcome or avoid a bad outcome.

- In essence, a framing effect is a change in people's decisions when the same objective information is presented in two different ways. You might think that framing effects arise because of some idiosyncratic factors. Perhaps people aren't consistent in their choices when decisions involve hypothetical outcomes or small monetary stakes. Or perhaps people just aren't very sophisticated

in how they use probability and magnitude information in their decisions. But framing effects aren't so easily dismissed.

Value Frames

- Framing effects can change what's important to us, whether outcomes seem good or bad. For example, if you look through the photographs of Olympic medal ceremonies, you'll see a consistent pattern. Again and again, the gold medalists seem very happy, the silver medalists seem neutral to unhappy, and the bronze medalists are beaming. It makes sense that the gold medalists are happy—they got the best outcome—but why are the bronze medalists happier than the silver medalists?

- Answering this question was the topic of a remarkable study by the psychologist Victoria Medvec and her colleagues. One possible explanation for this effect comes from the idea of reference dependence.

- This group of researchers examined the transcripts of interviews with the different medalists. The silver medalists were more likely to compare themselves to the gold medalist; they described how they almost won, how they could have been a gold medalist. The bronze medalists were more likely to compare themselves to those competitors who didn't win anything; they recognized that they could have done much worse, and they were happy to have at least won some medal.

- Silver and bronze medalists have different reference points. The silver medalists use the reference point of a gold medal, and they are disappointed—they regret not having done more. The bronze medalists use the reference point of no medal at all, and they are elated—they're satisfied with their performance.

- This is the typical effect, but there are exceptions. In general, the principle holds nevertheless: The same objective outcome can lead to disappointment or joy, depending on how it's framed.

- The way we frame something can even change our experiences, directly. Imagine that you are in the grocery store and see a package of ground beef that's labeled "90 percent lean." Immediately adjacent is a second package of ground beef from a different producer that is labeled "10 percent fat."

- The difference in labeling shouldn't affect consumers' attitudes or purchasing decisions. Those two labels just provide different frames through which the same information is presented. And this isn't an abstract or unfamiliar decision; it's a product for which shoppers have substantial experience and well-formed attitudes already.

- However, framing does affect consumer attitudes. Products described in the positive frame—like "90 percent lean"—are seen as higher quality and more desirable. In this case, emphasizing the leanness of the ground beef leads consumers to think that it will be less greasy, an important factor in their purchasing decisions.

- Does changing the descriptive frame alter how the product tastes? Yes. Participants in one experiment were first shown a label indicating either the leanness or the fat content of ground beef, and then they were given a small freshly cooked sample. Everyone sampled the same ground beef, so any differences in taste could only be attributed to what the label said.

Framing meat as lean or fat changes the way people perceive the meat.

- After they tasted the meat, people who had read labels indicating leanness rated the meat as leaner, of higher quality, and as less greasy—compared to people who had read about the fat content of the meat.

- Framing the same product in a different way actually changes how we experience that product. Specifically, it focuses our evaluation on particular attributes of the product, leading those attributes to dominate our judgments.

- As consumers, we should be attentive to such framing effects. We can mentally change the frame and change the desirability of a to-be-purchased product or our experiences after purchasing.

Temporal Frames

- Temporal framing is how the influence of time on our choices can change, depending on how a decision is framed. One such effect involves changing from a delay frame to an acceleration frame.

- Suppose that you have an investment—for example, a savings bond—that has now matured. If you withdraw it now, you'll receive 10,000 dollars, but if you allow it to remain invested for two more years, you'll receive 11,000 dollars.

- In decisions like this, people tend to be relatively impatient; they'd rather have less money now, instead of waiting for more money later. The decision scientist Elke Weber and her colleagues have argued that this impatience arises because people can easily bring to mind how they could use that money today.

- It's much harder to envision what you'll use money for in the future. You know that you'll need money for bills and expenses and trips, but those are all abstract needs, and they don't come to mind without prompting. So, money seems to be worth much less in the future than it is in the present.

- You can minimize this effect by changing the frame. Instead of thinking about your decision as a delay, think about it in terms of acceleration. You have an investment that will return 11,000 dollars in two years. You have the option of sacrificing 1,000 dollars of your investment to cash it in now. What do you do?

- This acceleration frame changes how people think. People report thinking more concrete thoughts about their future and about how they'll use the money. In turn, they become much more patient. They now know that they'll need the money in the future, and they don't want to take the sure loss of 1,000 dollars.

- Decision frames that call attention to our past also influence our decisions, even when they shouldn't. To be consistent over time, we should only make decisions based on the future benefits compared to the future costs. Past benefits and costs are just that—in the past. But they still influence our decisions.

Goal Frames

- Framing affects people's commitment to long-term goals. Goal framing differs from value framing and temporal framing in that it involves whether you continually take actions toward a goal, not whether you make a single decision.

- Suppose that you are an educator trying to encourage parents to teach their children good savings habits. The benefits of this program are straightforward: It helps their mathematical skills, helps them plan for the future, and teaches them basic economics—among many good features. So, how should those benefits be conveyed so that parents engage in the desired behavior?

- A positive frame could have the following hypothetical advice: Children whose parents teach them good savings habits by age eight are more likely to save enough money for retirement in adulthood. Alternatively, the same information could be presented in a negative frame: Children whose parents do not teach them good savings habits by age eight are less likely to save enough money for retirement in adulthood.

- Both frames have the same advice and are intended to encourage the same behavior—teaching children financial skills. But as a general guideline, negative frames are more effective. The negative outcome carries more weight than the positive outcome,

especially if people see a credible link between their action and that negative outcome.

- Negative frames are more effective when specific actions lead to concrete outcomes, but they can be less effective when the link between actions and goals is much weaker. Without tangible links between one's own choices and the goal, a negative frame can encourage disengagement rather than action.

Making Good Decisions

- Of everything discussed in this course, the simple framing effect provides the most powerful tool for making good decisions. You can readily change how you approach your own decisions by just changing the frame. Nothing about the external environment or the decision itself needs to change; you just need to approach the same decision in a different way.

- But because framing effects are so powerful, and ubiquitous, they can influence our behavior even when we're not aware. Consumer marketing is rife with framing effects. Like in the example of the 90-percent-lean ground beef, our very experience with a product can be shaped by the way information is presented on a product label.

- There are some ways that we can inoculate ourselves against unwanted framing. The best approach is to obtain independent information, evaluating our options before we know how they are labeled. People aren't as influenced by frames when they've already experienced the substance of the decision.

- There's one approach to framing that almost always helps—or, at least, almost always gives you new insight into your decisions: taking another's perspective. When you face a challenging decision, step away from it for a moment. Imagine that a good friend was faced with a similar decision. What factors would you want your friend to consider? What's most important and what can be ignored?

What would you think of your friend if he or she made one choice or the other?

- When we think about decisions from another's perspective, we engage new cognitive processes, and we minimize the influence of our immediate emotional state. Thinking about a friend's decision won't always give you to the right choice, but it can be a good guide as to what's really important.

- Finally, changing your frame can just help you feel better about your decisions, your successes, and your failures.

Suggested Reading

Loewenstein, "Frames of Mind in Intertemporal Choice."

Tversky and Kahneman, "The Framing of Decisions and the Psychology of Choice."

Questions to Consider

1. What is mental accounting, and how might it contribute to the sunk-cost fallacy?

2. How might framing instructions differently change the decisions people make about retirement?

Interventions, Nudges, and Decisions

Lecture 24

Throughout this course, you have learned how people *should* make decisions and how they really *do* make decisions. The focus has been on you and your decisions. But in this lecture, you are going to take a different perspective, a larger perspective. You will think of yourself as someone interested in shaping other people's decisions. In this lecture, you will learn how you can use what you've learned about behavioral economics, psychology, and even neuroscience to influence what other people choose—perhaps for your own benefit, and perhaps for theirs.

Information

- There are many different options available for shaping others' decisions, and there is no single approach that always pushes people toward good decisions. Sometimes institutional interventions like legislation or incentives will be necessary. Sometimes, although not often, information helps. And other times, the tools of behavioral economics like precommitment and framing can shape choices. The challenge for any policymaker, or parent, is knowing which tool works in which circumstances.

- In the realm of decision making, information is facts describing the outcomes that follow particular decisions. Giving people information about the outcomes of their potential decisions, especially in isolation, rarely helps them make better decisions. People mistrust information. They try to figure out what you're not telling them, and they mentally argue against the information provided.

- You also can't inoculate people against making bad decisions by telling them about their biases and the mistakes they'll make. Often, our biases affect us before we're even thinking of making a decision. We are more likely to seek out information consistent with our point of view—that's the confirmation bias.

- We don't necessarily even know when we're biased. For every effect described in this course, there are alternative explanations. We know that framing effects or ambiguity aversion exist—but not because we measure one person's behavior and see that they are influenced by a decision frame or ambiguity. We know that biases exist only when we look at groups of people; we can infer that the group shows framing effects, for example, even if we can't be sure about any one person.

- In addition, too often, our mistakes reflect failures of our will, not our knowledge. The problem of dieters isn't simply that they don't know what foods to avoid.

Nudges

- If incentives are too expensive and information is too ineffective, what's left? In recent years, behavioral economists and policy makers have begun working together to create policies that help people make better decisions.

- These policies aren't intended to limit choices—like legislation might—and they don't involve the introduction of new incentives. They introduce very small changes to the process of decision making, but those small changes can have large effects on decisions.

- The decision scientists Richard Thaler and Cass Sunstein use the term "nudge" to describe such policies: They're intended to give people a gentle push so that they start moving themselves in the right direction. If you want to nudge people, you should follow four basic steps.

    1. Identify some social issue that can be linked to poor decision making.

    2. Find a manipulation that changes what people can choose, the way outcomes are described, or the manner in which people make their decisions.

3. Introduce the manipulation, usually without telling people about it.

4. Track people's behavior and adapt your manipulation to reach the desired effect.

- Some nudges aren't really that controversial. When grocery stores place high-margin items at the end of aisles, that increases purchases of those items, but consumers don't stop shopping in protest.

Architecture

- People don't mind being nudged when the decision involves relatively low stakes and when their autonomy as independent decision makers isn't called into question. But nudges can be controversial and lead to resistance when the stakes are large and when people believe that they are giving up some freedom of choice.

- Suppose that you're now a human resources executive at a large multinational corporation. You have many thousands of employees, all of whom save for retirement through a defined-contributions plan like a 401(k). You want your employees to be well prepared for retirement, so your goals are completely aligned with those of your employees: They want their 401(k)s to grow, and you want their 401(k)s to grow.

- Your company implemented an opt-out 401(k) program a few years ago, and the program has had great effects on enrollment. Every new employee is automatically enrolled at a default three-percent contribution level, and very few of your employees ever drop out of that program.

- But things aren't perfect. Right now, your company allows employees to invest their 401(k) accounts in any of a half-dozen mutual fund companies, each with a dozen or more funds. And because of this diversity, many of your employees have suboptimal investment portfolios; they have large amounts of money in actively

managed funds instead of index funds, or they have the wrong balance of stock and bond funds for their age.

- You know that your employees would be much better off, overall, if you simplified their options. Instead of allowing investments in any of a large set of diverse funds, which leads to inefficient portfolios, you could choose a single provider of target-retirement-date index funds. These are low-fee, balanced funds that change their allocation from more risky investments to more safe investments as a target retirement date nears.

- For the vast majority of Americans, investing one's retirement in a single such fund would be demonstrably better than how they currently invest. Most people, in the real world and in this hypothetical example, would become better off by simplifying their retirement savings and prioritizing target-retirement-date index funds. So, how can you nudge employees to change their approach to retirement investments to something that's almost certainly better for them?

Paternalism

- By trying to shape their employees' retirement savings, the employer is in effect taking the sort of action that a parent would take with a child, helping them make a decision that's for their own good. As such, nudges have often been criticized as being paternalistic; they take away autonomy in a misguided attempt to make people better off.

- Let's consider the different nudges you might use—to

Having enough money to support oneself into retirement is a major concern among many people.

get a sense of whether the charge of paternalism is justified. You could transfer all existing employees' balances to an index fund connected to their own retirement date, and then require them to keep investing in those funds. This step is draconian, but it would indeed improve most employees' prospects for retirement and wouldn't hurt anyone that much. However, it raises the deepest ethical dilemma in philosophy: whether it's acceptable to help the greater number while also infringing on the rights of the few.

- This is the sort of paternalism that most people find unacceptable, but it's also not really a nudge. It cuts off choice options and, for exactly that reason, people won't support it. You need to find a nudge that improves outcomes for most people but doesn't seem to infringe on individual autonomy. You want a nudge that doesn't make choices for people but helps them make better choices.

- Based on your knowledge of endowment effects and precommitment, you know that people are often loath to change from some default option. So, you modify your opt-out program so that not only are all new employees automatically enrolled in the program, but they are also automatically enrolled in a target-retirement-date index fund appropriate for their age. After one month, they can change their fund distribution, or they can opt out of the program entirely.

- This sort of nudge is still paternalistic, but it doesn't preclude anyone from choosing a different investment strategy—it just starts people in a good default option. In addition, you know that many, many people will just stick with that option. The behavioral economist George Loewenstein and colleagues call this approach asymmetric paternalism: It helps people who would otherwise make bad decisions, but it doesn't impede the autonomy of people who want to actively pursue a different path.

- Selecting a good default option seems like a reasonable nudge because it helps people make better decisions, as judged against some external standard. But you could even go one step further.

You could try to nudge people so that they make better decisions, as judged against their own standards. Thaler and Sunstein describe such nudges as libertarian paternalism.

- So, as part of the mandatory employee orientation, you could have participants not only fill out the usual workplace safety forms, but you could also have them provide a sense of their retirement goals—to provide a measure of how their goals differ from those of others in the company. Then, you could structure their default plan to their specific goals.

- The same rules would apply as before; they can still opt out or change their investments at any time. But you've provided a starting point that's informed by their own stated preferences. Many people find this last option to provide the most acceptable balance between improving people's well-being and maintaining their autonomy.

- Not all nudges are this clean. In cases where there's conflict among people's preferences, like matching children to schools, there may be no way to structure a nudge or any other intervention without making some people worse off.

Autonomy and Neuromarketing

- Understanding how we make decisions can give you powerful tools—tools that can change the way you make decisions or the way others make decisions. So, there's naturally going to be suspicion that the scientific study of decision making will lead to manipulations that aren't quite as benign as the nudges just described. This suspicion is particularly strong for the neuroscientific study of decision making.

- In recent years, there's been an explosion of interest in what's often called neuromarketing, the use of measurements of brain function and related body states in order to improve consumer advertising, branding, pricing, and product design.

- Proponents of neuromarketing—many of whom run companies selling neuromarketing services—argue that neuroscience can provide hidden knowledge about what influences people's purchasing decisions and that companies can use that knowledge to optimize their marketing.

- Neuromarketing has a real future, as a complement to traditional approaches. When behavioral economic methods are combined with neuroscience, researchers can gain access to processes of decision making that are often difficult or impossible to study otherwise. Knowing how people respond to advertisements without having to ask for their opinions would be extraordinarily valuable information for marketers and decision scientists alike.

- However, at present, neuromarketing engenders suspicion. Many consumers worry that the neuromarketers will indeed gain hidden knowledge and that those marketers will develop proprietary procedures for pushing some "buy button" in the brain, leading people to purchase things they don't want or need. Frankly, that's not a practical concern now or even in the distant future, but it still casts a shadow over this sort of research.

- There's an ethical issue here that keeps recurring in many guises: The scientific study of decision making allows us to be manipulated. Researchers and institutions will know more about our decisions than we will. We'll lose our autonomy. But knowledge can give us autonomy.

Suggested Reading

Larrick and Soll, "Economics: The MPG Illusion."

Thaler and Sunstein, *Nudge*.

Questions to Consider

1. Why aren't interventions that deliver information—such as those about the dangerous effects of drugs on the body—effective at changing people's behavior?

2. What are nudges? What sorts of nudges are justifiable, and what sorts are infringements on individual autonomy?

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